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NATIONAL DEVELOPMENTS

SCIENTIFIC ADVANCES AT QINGHUA UNIVERSITY NOTED

Beijing BEIJING RIBAO in Chinese 25 Jan 80 p 1

[Article: "Qinghua University Records Scientific Achievements in 1979; Some Projects Fill China's Scientific and Technological Gap While Approaching or Even Reaching and Advanced International Standard"]

[Text] Advancements have been made in reorganizing scientific research work at Qinghua University. Last year, in accordance with the concept "the core of education is also the core of science" and based on the demands of the four modernizations and the special features of the school we drew up plans for scientific research within the university. We also transferred the emphasis of scientific research from the research and development of goods, production technology and engineering design to resolving the problems of science and technology. Stress was placed on the study of basic theories and new scientific developments. Each department and teaching and research section reorganized and actively developed their research work. For the entire year there were 76 scientific projects either totally or partially completed. Some of these projects served to fill China's scientific and technological gap while approaching or even reaching an advanced international standard.

The automatic compensation double frequency laser beam interferometer jointly produced by the precision tools department, physics teaching and research section and automation department is an urgently needed precision measuring instrument for photology, machinery and electricity. Although there was no contact with foreign countries, they strove to make their country strong, studied arduously and developed original plans. The measuring of the length, the angle and the degree of precision in an automatic compensation system has approached or even reached the technical quotas of the same products manufactured abroad. Last year, the chemistry teaching and research section produced phenyl cyclo-hexane liquid crystals and TPC-12 combined liquid crystals. This is the first time China has been successful in developing a new form of liquid crystal which is sufficient to meet the urgent needs in electronic watches, miniature computers and various instruments which utilize digital screens. Presently, it has been put into operation in the Tianjin No 2 reagent factory. It is used to induce an eddy current for non-contact measurement of axial displacement, amplitude and axis path in high speed rotating axles which was a newly emerged technology which developed internationally during the 1970's. The QH-5 model non-conduct displacement and vibration surveyor was produced by the precision tools department in 1979 and its principal technical indicator approaches and might even reach up to an advanced international standard. The computer department with the Peking Radio Factory No 3 has received high scientific and technological commendations for their development of the DJS-140 computer. The various units considered that this type of computer with its many advantages is a model which is urgently needed for present domestic use in the areas of scientific computation, data processing and process control. This department's success in developing a magnetic disk access method and a disk operating system resolved one of the key equipment problems in the general usage of this kind of computer and contributed to modifying its overall usage. The oblique porous overflow tower plate developed by the chemical engineering department is a new form of plate tower made in China. It can raise productivity by 30 percent and is already being used in many chemical engineering factories. Nuclear energy research led to the development of an x-ray ionization chamber which employs rolled steel and other materials to produce the key components for the instrument to measure the thickness of a ray. Random tests have displayed excellent results. This development has decreased the deficiency in China's x-ray examination instruments.

During 1979 the school published 260 scientific articles from within and outside the university. Professor Qian Ning of the hydraulics department summarized the combined work done by the Mud and Sand Research Laboratory of Qinghua University and the Yellow River Water Conservancy Committee in an article entitled "The Development and Future Outlook of Mud and Sand Kinetics." In the article he summarized the developmental process and kinetic laws of mud and sand kinetics in China and abroad in the last half century, mentioning present and future research directions. This article received serious attention domestically and abroad leading to preparations for an international mud and sand academic exchange meeting in 1980. During the last year or so, they have extensively developed international academic exchange and according to statistics there have been 26 foreign scholars from different fields who have come to lecture at Qinghua University. Furthermore, 60 graduate students and those interested in advanced research have been sent to study in 13 foreign nations including the United States, Japan and West Germany while 30 people have gone abroad to participate in various academic meetings resulting in many articles and reports. These academic activities have advanced scholarly thought, achieved the exchange of research and promoted the development of scientific research work in the university.

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PHYSICAL SCIENCES

ANALYTIC CHEMISTRY RESEARCH MAKING STUDIES

Beijing HUAXUE TONGBAO [CHEMISTRY BULLETIN] in Chinese No 4, 23 Jul 79 pp 4-9

[Article by Cheng Jieke [4453 0094 0344], Liu Jinchun [0491 6930 2504], Luo Qingyao [5012 1987 1031] and Zeng Yune [2582 0061 7725] of the Chemistry Department of Wuhan University: "Development of Inorganic Analytical Chemistry in Our Country"]

[Text] Before Liberation, analytical chemistry was a very weak branch among the disciplines of chemistry in our nation. Very few people were engaged in research in analytical chemistry. Their research work involved primarily the use of gravimetric, volumetric and colorimetric analysis. The majority of reagents and glassware used were imported. Although the research papers published reached a certain level, they were few.

In the last 30 years a great change has taken place in the outlook of analytical chemistry in our nation. It has become one of the relatively fast developing disciplines. Universities and colleges have trained thousands of analytical chemists and sent them to science academies, governmental research institutes, factories, mines and schools to engage in chemical analysis. Unfortunately, due to interference by the "gang of four," the caliber of students of later classes dropped greatly. Self sufficiency has been basically achieved in terms of the availability of ordinary apparatus and reagents. Some modern high precision, high resolution and pioneer analytical apparatus and special reagents have been manufactured on a trial basis. At present, our nation's research in analytical chemistry is being launched in such fields from chemical analysis to instrumental analysis, from ordinary quantitative analysis to microanalysis, from whole analysis to microscopic analysis, from whole analysis to surface distribution analysis and layer analysis, and from macroscopic composition analysis to microscopic structural analysis. In the 30 years prior to Liberation, only a total of slightly more than 100 papers in analytical chemistry had been published in our nation. Now, the journal of analytical chemistry has become an "eye" for metallurgy, geology, mechanical and chemical engineering, and environmental sciences. In the last 30 years our nation's accomplishments in various domains of analytical chemistry have laid a firm foundation towards further development of modernization. This paper briefly reviews only the development in inorganic analytical chemistry in our nation.

Dissolution of Samples

Dissolution of samples is a necessary step in wet analysis. To speed up analysis, studies to improve the method of dissolving samples have succeeded in increasing the efficiency of dissolution and reducing contamination. Phosphoric acid forms pyrophosphoric and polyphosphoric acids at high temperatures and undergoes complexing reactions with metal ions. Phosphoric acid has therefore been used effectively to decompose mineral ores such as chromic and nickel iron ores which are difficult to decompose. Treatment with ultrasonic waves can accelerate decomposition of silicate minerals which are hard to dissolve. In recent years, polytetrafluorethylene sealed vessels have been used for heating in steel casings to hasten decomposition of samples which are difficult to dissolve in acids under normal pressure. The boiling point of acids was raised under applied pressure up to 200° to dissolve metals of the platinum family and their alloys, cerium oxide, titanium iron ores and niobium-tantalum iron ores which are difficult to dissolve. Dissolution of materials of high purity can reduce contamination and reduce gaps in the science.

Concentration and Separation

Because of the complexity and multiplicity of samples and the need for determining the composition of trace amounts, methods of concentration and separation are frequently indispensible in modern analytical chemistry.

Precipitation is a classical method of separation. In the study to improve the method of precipitation, uranium, aluminum, copper, nickel, zinc and iron have been effectively separated by precipitation in small volumes of concentrated solutions because polymerization and dehydration can cause the volume and surface of the precipitate to be small and reduce absorption. Progress in homogeneous precipitation has been made, for example, in the use of gradual decomposition of complex ions of cyanotungstic acid radicals and oxalic tungstic acid radicals to bring about homogeneous precipitation of tungstic acid, and the use of benzohydroxylamine and sodium nitrite to gradually produce N-nitrosyl benzohydroxylamine for the homogeneous precipitation of zirconium.

The study of organic precipitants has been concentrated on the selective precipitation and separation of rare elements such as zirconium, scandium and thorium. New types of precipitants such as ammonium ferrofluoride which is used to precipitate sodium to form $Na(NH_4)_2FeF_6$ have been used to determine sodium in rocks.

Coprecipitation to concentrate trace elements is widely used in environmental analysis of natural water, sea water and materials of high purity. For example, coprecipitation by ceric iodate can separate traces of thorium from large amounts of rare earth metals. Radioisotope tracing and thermogravimetric analysis have been used to study the mechanism of precipitation and composition of precipitants.

In recent years, the "coordinated enclosing functions" of many kinds of "enclosing agents" [7148 5599 0495] were studied and the selectivity of precipitation received attention. For example, when using sodium hydroxide to precipitate rare metals, traces of rare metals can be separated by precipitation all at once from alloy steel under high temperatures using triethanolamine to enclose iron and aluminum, using hydrogen peroxide and EDTA to enclose titanium and chromium, and using diethylamine to enclose nickel, cobalt and copper. Sodium hydroxide-EDTA-triethanolamine can precipitate and separate magnesium from iron ores.

Solvent extraction is simple, fast, and suitable for concentration and separation of trace elements. More studies have been made in the use of chelate extractants. The extractant 1-benzene-3-methyl-4-benzoyl ketopyrazoline (5) (PMBP) which is used to extract lanthanides, actinides, alkaline earth elements and tungsten is also used widely to extract traces of rare earth elements, thorium and calcium from mineral ores, alloys and steel and iron. Phosphorous extractants have been studied more systematically. Extraction of copper, lead, zinc, iron, cobalt, nickel, cadmium, bismuth, uranium and thorium by ammonium extractant N-235 (mainly 3-caprylamine) was also studied.

Our nation's chemists have made proposals concerning classification of extracting systems, and have studied some coordinate extracting systems and their extraction mechanism (composition and structure of extractants).

Attention has been given to columnar liquid phase chromatography in the separation of Lanthanides, actinides, niobium-tantalum and zirconium-hafnium which have similar properties, as well as to the concentration and separation of trace materials.

Achievements have been made in the separation of rare earth elements using ion exchange chromatography. In analyzing separations, work involved mainly the study of concentration and separation of traces of rare earth impurities in highly pure and singular rare earth elements and other rare earth elements produced by fission. For example, trace amounts of rare earth impurities were concentrated and separated from highly pure yttrium oxide using a large porous cation exchange resin and α-hydroxy-isobutyric acid as the (extraction) scrub. In the ion exchange in a mixed system of an organic solvent and water, studies of anion exchange of the elements zinc, copper, cobalt, manganese and nickel in a mixed solvent of ethyl alcohol (or acetone)-hydrochloric acid showed that the effect of organic solvents is mainly due to dehydration and a tendency towards an increase in the formation of complexes. In studying the ranked equilibrium theory of inorganic ion exchange, its relationship with the theory of absorption was quantitatively discussed and derived. Two methods of calculating the values of K suitable for use in ordinary water solvents or sea water system were proposed. The ion exchange method was also applied in studying the mechanism of complexing reactions. Some achievements were made in the study of separating alkaline metals from alkaline earth metals using inorganic ion exchangers.

Studies were done in the separation of zirconium, hafnium, thorium, scandium, yttrium, and lanthanides using phosphorus containing extractants TBP, P-204 (2(2-ethyl, hexyl) phosphoric acid), P-507 (2-ethyl, hexyl monophosphine 2-ethyl, hexyl ester), and cyclo-paraffin acids as fixed phases.

Progress in hastening the speed of separation and raising the efficiency of separation using fast liquid phase chromatography has captured people's attention, and preliminary exploration has been made in the separation of lanthanides and actinides.

In paper chromatography and paper electrophoresis, studies have been conducted in the separation of metals which are difficult to dissolve and lanthanides, elements of the platinum family and rare and scattered elements using paper chromatography. Some solvent systems have been proposed, such as TBP, methyl isoketobutyl-ethyl acetate, as expanders to separate light rare earth elements. Improved sulphocyanic ketobutyl-nitric acid as an expander can precipitate all lanthanides at once by paper chromatography. Reverse paper chromatography frequently yields better separation results. The use of TBP, P-204, 3-caprylamine as fixed phases were also studied. The use of reverse paper chromatography to study the mechanism of TBP extraction of uranyl ions indicated the results of paper chromatography and extraction are consistent.

Results of separation of alkaline metals by inorganic ion exchangers ammonium phosphomolybdic acid and ammonium phosphotungstic acid in paper chromatography are more satisfactory, and the use of paper electrophoresis can shorten the time of separation. Layer separation of cations of 28 kinds of metals on stannic phosphonic acid paper was studied.

The separation of acidic or neutral organic phosphides by paper chromatography and paper electrophoresis was studied, and quantitative measurements were obtained by the method of calculating the areas of color spots. A method of using the membrane process of electric osmotic analysis to determine and make quantitative measurements of uranium deposits in minerals were proposed.

Separation of niobium, tantalum, precious metals, selenium, tellurium, titanium, zirconium, uranium, thorium and scandium was studied using thin layer chromatography. It was also frequently used in the analysis of residues of organic phosphorus and chlorine-containing agricultural chemicals in environmental analysis. Thin layer chromatograms of the composition of traces of pyrite and chalcopyrite were also studied.

Classical Chemical Analysis

Gravimetric analysis is seldom used in routine analysis, mostly limited to the determination of silicon dioxide, tungstic acid and molybdenum sulfate. But it is still a frequently used method in judgement analysis, tagged sample analysis and national standard analysis. Electrogravimetric analysis of copper is also widely used.

Volumetric analysis is widely adaptable to the determination of high composition materials because of its higher precision. The method of complexing titration is widely used. To raise the selectivity of titration and eliminate interference, some achievements have been made in exploring new types of "enclosing agents." (Complexing agents.) Complexing agents such as α-hydroxy carboxylic acids, malic acid, lactic acid and bitter almond acid act as "enclosing agents" of such elements as titanium and tin. Malic acid can displace EDTA from complex compounds of light rare earth elements and EDTA, and it is possible to use it in spectrophotometric titration of light rare earth elements. Using α (or β)-aminopropionic acids as "enclosing agents" to directly complex and titrate zinc in copper alloys and zinc ores can avoid the use of extremely poisonous cyanides. Some studies in indicators and titrants have also been done.

In microvolumeric analysis, the method of catalytic volumeric analysis was proposed for the detection of ppb level osmium and ruthenium. Complexing titration of micrograms of rare earth elements and thallium was studied. To prevent mercury contamination, various methods of volumetric analysis without the use of mercury to determine iron were studied.

Photochemical Analysis

Photometric analysis by photoabsorption is one of the most studied and most widely used method. To raise the sensitivity and selectivity of the method, the study of "color producing agents" has always been prominent, mostly involving the study of azos, tribenzene methanes and hydroxy amines. Azos are a kind of relatively sensitive "color producing agents" and they have been studied the most. PAN, PAR, PADAP, PADAB, PADAT, azoarsine III, azochlorophosphide III, dicarboxyl azoarsine III and azonitrocarboxylic acid, have already been used in scientific research and daily analysis. For example, the use of PADAT to determine palladium, 5-Br-PADAP to determine antimony and HAR to determine beryllium is highly sensitive. The values of ε (molar photoabsorption coefficient) all reached 10^5 in the determination of light rare earth elements by azonitrocarboxylic and the determination of cobalt by 5-Br-PADAP, showing a high sensitivity. Color producing reactions and elimination of interference were studied in depth, and the knowledge was applied in the analysis of steels and minerals. A high sensitivity can also be obtained by using alkaline dyes of tribenzene methanes for ion association in extraction and colorimetric analysis. For example, in the determination of rhenium and boron by ethyl purple and the determination of antimony, tantalum, mercury and gold by iodine green, the ε values all reached or approached 10^5. In recent years, attention was given to largy cyclic compounds of water soluble porphyrins as "color producing agents." The color producing reaction between lead and 4-(para-sulfobenzene) porphyrin was highly sensitive and the value of ε reached 2.6×10^5.

Triple Complex and Multiple Complex Compounds

Remarkable achievements have been made in the application of triple complex and multiple complex compounds in photometric analysis by photoabsorption and progress was rapid. Some new triple complex compound systems were studied, such as copper-phthalein-fluorescein resorcinol chloroform used for extraction. It is a highly sensitive method of determining copper. In the triple complex and multiple complex systems of molybdenum, tin, germanium and benzofluorenone-hexadecylbromide trimethyl ammonium, the values of ε all reached 10^5. The sensitivity of determining molybdenum is presently one of the highest. Triple complexes of beryllium-chrome green R (or chromazurine S)-hexadecylbromide pyridine also have a high sensitivity. They have all been applied in actual analysis of steels and mineral ores.

The use of "enclosing agents" to eliminate interference and raise the selectivity of color producing reactions can be done frequently without separation, and direct photometric analysis by photoabsorption is possible. According to differences in the stabilities of complex compounds, a buffer enclosure method of complexing was studied. For example, by using Zn-EDTA, Zn-EDTA diethyl ester, Zn-HEDTA, Ca-EDTA, Ca-CTDTA, Ba-EGTA complexing buffer systems to enclose the interference by many elements such as iron, aluminum, chromium, nickel, copper, tungsten, molybdenum, manganese, titanium, zirconium, calcium, a quick way of determining rare earth elements, aluminum, cobalt, beryllium, magnesium in steels and other materials was established.

Photometric analysis by photoabsorption is frequently not sensitive enough in the analysis of highly pure substances and environmental pollution. Thus some trace techniques were used to elevate the sensitivity of this method. For example, the use of a photometric trace extraction technique to determine traces of phosphorus and boron in silicon tetrachloride yielded a lowest amount of 5 ng, the lower limit of the measurement reached 3 x 10^{-8}%. Photometric analysis by photoabsorption of spots on paper and chrome green R which can measure 4 ng of beryllium can also be used to detect traces of beryllium in the atmosphere.

Spectrophotometric analysis of the visible range of ultraviolet light was used to determine some singular rare earth elements in rare earth mixtures. Spectrophotometric analysis by differential photoabsorption was used frequently to determine composition of high contents such as in the determination of high contents of tungsten in steels and mineral ores. For quick analysis in steel and iron forehearths, a wet type automatic high speed analyzer was developed like the silicon-manganese-phosphorus triple element transistor automatic analyzer which can give the results of photometric analysis of the three elements simultaneously within 3 to 4 minutes.

The study of the mechanism of color producing reactions was also emphasized. Most of the basic data on complexing ratios and constants of instability were determined, and structures of complex compounds were determined with the help of infrared spectroscopy and other methods. In determining phosphorus in iron-containing samples using the method of sodium fluoride-stannous chloride molybdenum blue, two types of phosphorous molybdenum blue of different properties were discovered. Both were used to determine phosphorus but the degrees of sensitivity were different. The formation of the two types of phosphorous molybdenum blue was carefully explored and the mechanism of their formation was understood.

Ordinary instruments for photometric analysis by photoabsorption, such as model 72 and model 72-1, have a visible spectrum spectrophotometer of stable quality and their use is very widespread. The model 751 ultraviolet-visible spectrum spectrophotometer and the model 710 ultraviolet-near infrared automatic recording spectrophotometer are commercially available.

Dynamic catalytic photometric analysis is highly sensitive and is widely used in geological prospecting for mineral ores of the platinum family. For instance, determination of osmium, ruthenium, yttrium and palladium has reached a sensitivity of the ppb level. Catalytic color producing reactions of such elements as silver, vanadium, niobium, tantalur, cobalt, copper, and sulfur were all studied.

Fluorescence photometric analysis is more sensitive than photometric analysis by photoabsorption. The fluorescin mercury fluorescence method can determine sulfur of 0.07-1000 ppm, and it has been used in the determination of traces of sulfur in natural gas and steels. The method of using aluminum-morus tintoria to determine traces of fluorine in natural water has a sensitivity of 2 ppb. Fluorescence spectrophotometric analysis can simultaneously determine zinc and cadmium, and it has been used in the analysis of rare earth elements cerium, gadolinium, and terbium.

The infrared spectrum has been called the fingerprints of molecules. It not only has been widely used in organic analysis, but also is being popularized in the study of minerals and inorganic compounds, such as the use of infrared spectroscopy to determine the composition of garnet in sical rocks.

Emission spectroscopy can quickly and economically perform quantitative analysis of many elements simultaneously, and it is one of the most popular methods in use. In geological prospecting, several million pieces of samples need to be analyzed every year. Several tens of million pieces of data are reported, and emission spectroscopy has played an important role. The principles and methods of quantitative analysis of minerals by spectroscopy were studied, and the knowledge was applied in the study of deposits of many ore-like elements and in determination of minerals. The method of electric arc concentration, hallow cathode method, aura control method, and the blow method have all been used.

In recent years, achievements have been made in the development of excited light source. The electrical inductance coupling high frequency plasma light source (ICP) has been successfully assembled and installed at some units. For example, the ICP with a high frequency plasma generator of 33 megahertz and

3.5 kilowatts of capacity has a detection limit of 0.1 to 10 ppb when used to determine the elements aluminum, calcium, beryllium, strontium, barium, titanium, ytterbium and zirconium. Its precision is also superior to electric arc and spark light sources used in the analysis of ordinary amounts of such elements. Because the sensitivity of ICP is high, because its stability is good, and because it has less interference, it has developed rather fast. Direct current plasma light source was also studied. Studies have also began in the use of glow discharge light sources for layer analysis and analysis of the composition of high contents.

Photoelectric spectroscopy has been used in the forehearth analysis of non-ferrous metals in smelting of such metals and in the analysis of silicate ores. The computer, a high speed light source and techniques of wind-moved samples, automatic cutting and grinding and automatic transmission of the results were used in analysis. Analytical techniques using photoelectric spectroscopy have already become an important direction in the development of automation of analysis in steel and iron smelting in our nation. The 41W plane light grid photoelectric spectroscope and the WZG-200 vacuum type ultra-violet light grid photoelectric spectroscope which were successfully developed on a trial basis have already been used in daily routine analysis.

Analysis by laser probe of microscopic areas using laser to evaporate microscopic areas of test samples has been used in the qualitative and semi-quantitative analysis of simple minerals.

The method of spectrophotometric analysis by atomic absorption was used in the exploration of interference in atomic absorption. Some studies were done in the use of organic solvents to raise the effectiveness of the sprayed mist and the sensitivity of the heated cloud chamber. Studies in background compensation of the Chapman effect have already begun. The method of cold atomic absorption to detect traces of mercury in environmental pollution analysis has already been popularly used. To raise its sensitivity, electrolytic mercury was used to unify concentration. The lower limit of the method of flameless atomic absorption by electrically heated atoms to determine traces of mercury has reached 0.08 ppb.

The method of flameless atomic absorption received attention because of its high sensitivity. It has already been used in the study of detecting traces of many elements such as lead, cadmium, beryllium, aluminum in natural water, soil, mineral ores and highly pure substances and various materials. A high temperature graphite furnace atomizer was also developed on a trial basis.

Several dozen kinds of hallow cathode lamps for studying elements are already available domestically, and various types of atomic absorption spectrophotometer have been manufactured. Many units have developed the acetylene and nitrous oxide generator and have assembled and installed the instrument themselves. This has expanded the application of the method of atomic absorption in many fields.

The sensitivity of the method of fluorescence spectrometric analysis is equivalent to the method of atomic absorption but there are fewer spectral lines and a monochrometer need not be used. There have been some instruments that are self designed and assembled which have been used in the determination of zinc, manganese and magnesium in aluminum alloys. A cold atomic fluorescence mercury detector has also been developed on a trial basis.

The method of luminous spectroscopy uses X-rays as the excited light source, a light grid to separate the light waves, and a photoelectric multiplier tube for testing. Luminous spectrometers assembled by ourselves have been used in the study of determining traces of rare earth impurities in highly pure rare earth materials, such as in the detection of samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium and thulium in yttrium oxide.

Electrochemical Analysis

In polarographic analysis, studies have begun in classical polarography, oscillographic polarography, square wave polarography and pulse polarography.

A lot of work has been done in the exploration of polarographic waves of catalysis and greater achievements have been made. The polarographic waves of catalysis of over 30 elements have been studied, such as the absorption wave of catalysis of molybdenum (VI) in the sulphuric acid-bitter almond acid-chlorate system. The sensitivity reached 6×10^{10}M. The polarographic wave of hydrogen in catalysis of iridium, rhodium and platinum had a sensitivity of 10^{-9} to 10^{-11}M. Recently, polarographic waves of catalysis of rare earth elements were explored and it was discovered that in the presence of ammonium chloride and copper and iron reagents, except for europium, all rare earth elements produced polarographic waves of different sensitivities in catalysis. These sensitive polarographic waves of catalysis have already been applied in the analysis of mineral ores, analysis of highly pure substances and in environmental protection.

Because polarographic dissolution first undergoes electrical concentration and then electrodissolution, the sensitivity is high. Studies have been made of the various types of electrodes, suspended mercury electrode, mercury film electrode, grid, silver and various graphite electrodes and carbon paste solid electrodes. For example, the platinum ball-mercury film electrode and the high speed polarograph with automatic programmed control assembled by ourselves were used in the determination of copper, lead, cadmium, nickel and tin. The lower limit reached the ppb level.

Pulse polarograph has the highest sensitivity among the various kinds of polarographs at present. The successfully developed JP-M1 type pulse polarograph has a lower limit reaching the ppb level. The method of pulse polarographic dissolution has a lower limit reaching 10^{-11} to 10^{-12} gram/millileters, and it has been used in the determination of trace elements of 10 ppt of mercury and 1 ppt of cadmium.

A simplified mechanical square wave polarograph was successfully developed. The quality of the JP-1 type oscillographic polarograph is stabler. It not only satisfies the operational needs of all sectors but is also exported for sale abroad.

Some achievements were also made in polarographic theory. For example, formulas of square wave polarograms, oscillographic polarograms, interflow polarograms, and the theory of electric currents in catalysis were studied.

Ion selective electrodes have since the 1970s developed rapidly in our nation. Various noncrystal electrodes and gas sensitive electrodes totaling over ten types have all been developed. Specialized measuring instruments have also been developed on a trial basis.

Applications of ion selective electrodes are continuously increasing in monitoring the environment, metallurgy, chemical engineering, seismological forecasting and clinical analysis. Ion selective electrodes are suited for flow process control and automatic analysis. Work has already begun in the determination of chlorides in drainage, fluorine in solutions of technological flow processes, chlorine in water and intermediate products in the making of soda, potassium, chlorine and oxygen in blood.

Some research was done in the Coulomb method and automatic coulomb analysis of traces of chlorine, bromine and iodine in organic compounds. The double medium coulomb method was used to determine phenols and thus monophenols as well as polyphenols. Coulomb analysis of vanadium, titanium, iron, chromium, and manganese was also studied.

The coulomb method has been used in the analysis of gases in steels and metals. Various types of coulomb analyzers have been produced. They can detect oxygen and carbon within several minutes and are used for forehearth analysis. The cell type coulomb analyzer is used to monitor nitrides and oxides in the atmosphere. Its detection of NO_2 has reached the ppb level.

Various methods of electrical capacity analysis such as electrical potential titration, electrical current titration, electrical conduction titration and high frequency titration methods were studied. Automatic electrical potential titration to determine cobalt is used in analysis of nonferrous metals.

X-ray Analysis

X-ray fluorescence spectroscopy has simple spectral lines and a high selectivity. It is used mainly to study rare elements such as rare earth elements, niobium, zirconium, tantalum and hafnium which are difficult to separate, for example, in the study of using solutions to analyze ordinary amounts of mixed rare earth elements. The use of thin samples for determining niobium and tantalum in mineral ores has eliminated the effect of the changes in chemical composition of the test samples upon the results of analysis. Basic compensation in peak-anticline comparison was explored. This method can quickly analyze traces of elements in various kinds of rocks. The multiplex X-ray fluorescence spectroscope was used in combination with a computer. This method can analyze many elements simultaneously within several minutes and it has been applied in geology and metallurgy.

The use of the energy dispersion and semiconductor detector in X-ray fluorescence analysis is a new technique of the 1970s. Analysis using proton excitation, Si(Li) semiconductor detector and a combination of the computer with proton excited X-ray energy spectroscopy has been applied in the simultaneous determination of many elements of 0.005 to 93 percent content in the Jilin meteorite.

Portable X-ray fluorescence analyzers using isotopes as excitation sources have been used in outdoor geological prospecting.

Analysis using electronic probe of microscopic areas has applied X-ray spectroscopy to microscopic areas. Research began in the 1960s mainly in the determination of simple mineral particles and structural analysis of minerals as well as in the study of oxidation and erosion of metals, phase analysis, polarimetric analysis and detection of metallic impurities in metallurgical products. In archaeological studies, the electronic probe has become a forceful tool for analysis. For example, the iron blade of the copper ax of 3000 years ago unearthed at Gaocheng County in Hebei Province was analyzed and it was determined that the blade was made by finishing a piece of meteorite. To adapt to the development of electronic probe analysis, an electronic probe X-ray microscopic analyzer has been built.

Other Methods of Analysis

X-ray diffraction has been used in the study of crystal structures and mineralogy. The use of the dispersive X-ray diffraction technique in X-ray structural analysis in microscopic areas has accurately determined the matrix parameters of single crystals.

Spark mass spectrometry was used in the analysis of trace elements such as in the analysis of over 20 elements in a 999999-pure lead oxide. The relative sensitivity was generally 10^{-6} percent.

Ion prode of microscopic areas was used to analyze layers, and the changes in the depth of the surface of test samples and the contents of elements were studied. It has been to study metals semiconductors and minerals. Recently, the LT-1 model scanning type ion probe mass spectrometric analyzer was successfully developed. Its relative sensitivity reached 10^{-7} percent. It can detect a distribution several dozen angstroms in depth. It has contributed towards self reliance in developing our nation's technique of microscopic area analysis.

In radioactive analysis, neutron activation in a reactor pile, activation of charged particles, and activation of fast neutrons of the neutron generator have been studied. The use of radioisotope dilution to determine traces of materials was also reported.

In the past 30 years under the leadership of Chairman Mao and the Chinese Communist Party Central Committee, our nation's analytical chemistry had achieved a definite development, but because of interference and sabotage by Lin Biao and the "gang of four," the development of basic theoretical research and modern instrumental analysis have been greatly affected in such a way that our nation's level of anlaytical chemistry when compared to the advanced international level, is still in a relatively backward state at present. We deeply believe that under the leadership of the Party Central Committee headed by Chairman Hua, in the new long march towards hastening the realization of the four modernizations, our nation's analytical chemistry will develop prosperously. A new situation will be created and it will contribute to the climb towards the peaks of science!

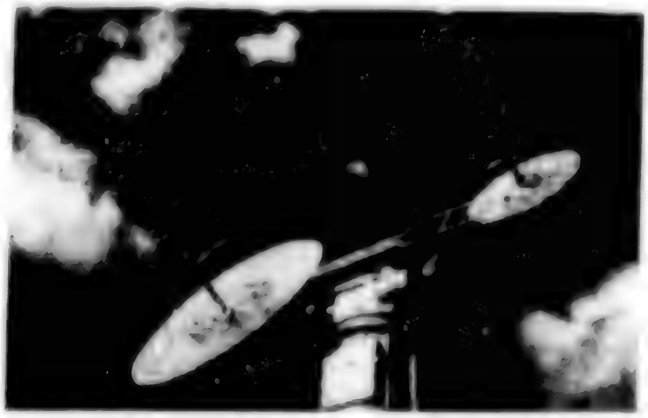
9296
CSO: 4008

YUNNAN OBSERVATORY UNDER CONSTRUCTION

Beijing GUANGMING RIBAO in Chinese 11 Feb 80 p 2

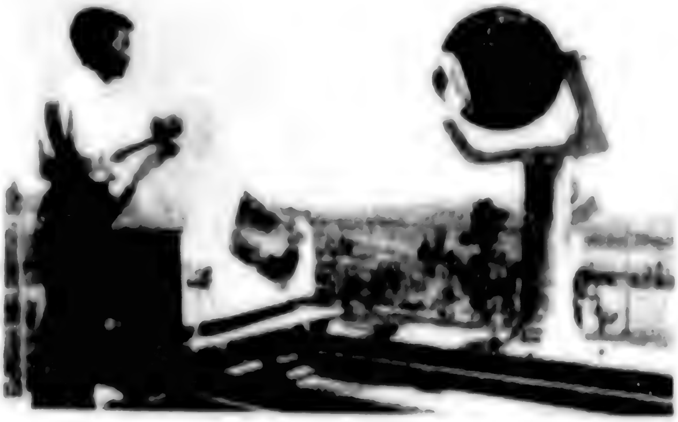
[Article: "Yunnan Observatory Under Construction"; photographs by reporter Shu Hongjun [5289 7703 6874]]

[Text] The Yunnan Observatory being built at Kunming is a comprehensive observatory mainly for the observation and study of astrophysics. At present, it is already engaged in observations and research in astrophysics, radio astronomy, solar physics, man-made satellites, time latitudes and application of new techniques in astronomy. Construction is presently still underway. Due to the active efforts of scientific and technical personnel, many achievements have been made in scientific research work.



A double frequency Doppler speedometer made by our nation can observe man-made satellites, can be accurately fixed on satellite orbits, and is also a means to study the theory of motion of man-made satellites. The picture shows the spiral antenna of the equipment.

In May of last year, installation of this one-meter reflecting type telescope for astronomical observations was completed. It can perform photometric and spectral studies of such celestial bodies as stars and gal...



The observatory has a horizontal solar spectrometer built by self-reliance to [illegible] the structure and change of the magnetic field of sunspots to [illegible] the indications of solar flares. The picture shows a scientific technology [illegible] operating mirror to reflect sun light into the chamber of the spectrometer for [illegible]metric observations.

Radio astronomical observations are an important means to obtain astrophysical signals. This observatory has already begun to observe and inspect solar radio explosions, and several other radio telescopes are being installed and tested in preparation for making radio observations during the total solar eclipse this year. The picture shows one corner of the radio astronomical observation area.

APPLIED SCIENCES

FIRST HIGH ENERGY PHYSICS EXPERIMENTAL CENTER BUILT

Beijing XIANDAIHUA [MODERNIZATION] in Chinese 16 Jan 80 inside front cover

[Photos by Yang Wumin [2799 2976 2404] and Shu Hongjin [5289 7703 6874]: "China's First High Energy Physics Experimental Center Under Construction"]

[Text]

Fig. 1. Comrade Fang Yi, Vice Minister of the State Council and President of the Chinese Academy of Sciences visits the center to ascertain the situation and to hear the opinions of the scientists and technicians in order to promptly resolve construction problems.

Fig. 2. Scientists and technicians involved in the construction study the overall arrangement of the 50 billion electron-volt proton synchronous accelerator for a rational design.

Fig. 3. Scientific and technical personnel test vital equipment for an experiment in high energy physics--the Cherenkov counter.

Fig. 4. Scientific and technical personnel involved in the project study and test the 250-kilovolt pre-injector.

Fig. 5. Another instrument for high energy physics experiments--the time-flight spectrometer, a model of which is being tested.

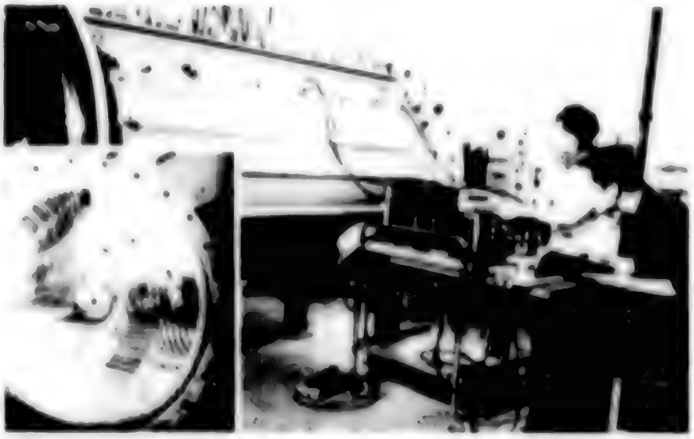


Fig. 6. Experimental linear accelerator chamber developed by the High Energy Physics Institute of the Chinese Academy of Sciences. Inset at lower left shows the inner structure of the chamber.

9298-R
CSO: 4008

USE OF WEATHER SATELLITE DATA DESCRIBED

Beijing DAQI KEXUE in Chinese Vol 3, No 3, Sep 79 pp 239-246

[Article by Tao Shiyan [7118 6108 6056], Fang Zongyi [2455 1350 5030], Li Yulan [2621 3768 5695] and Xiao Wen'an [5135 4489 1344], Institute of Atmospheric Physics, CAS: "The Use of Meteorological Satellite Data in Our Country for Weather Analysis and Forecasting"; manuscript received 26 April 1979]

[Text] Our country began to use meteorological satellite data in weather analysis and prediction in 1969. Currently all provinces have automatic picture transmission (APT) receiving stations. Most of the APT-system stations receive the TIROS-N satellite's low-resolution scanning radiometer cloud pictures, while some of them receive cloud pictures from a Japanese stationary weather satellite. The Central Weather Station also receives satellite air and wind data for the Pacific from the World Weather Center in Washington and the Japanese weather bureau. In making short-term weather forecasts, the personnel of most weather forecasting departments generally use data from satellite cloud pictures. On the basis of experience using weather satellite data over the last 10 years, we believe that such data are useful in improving weather analysis and prediction, particularly in the Tibetan Plateau and in the sea areas bordering our country, and that the satellite data are an important tool in weather analysis and forecasting.

1. Use of Satellite Cloud Pictures for the Tibetan Plateau

The Tibetan Plateau, the world's largest plateau, is located between latitudes 26° and 40° N and longitudes 70° and 104° E. It is more than 5 kilometers above sea level and has an area of more than 2 million square kilometers. It exerts a major influence on China's and Japan's weather and on the atmospheric circulation of the entire Northern Hemisphere. Many systems either pass through the plateau or arise in it, thereafter affecting the eastern regions of our country as well as Japan. Because meteorological observation systems are sparse in the plateau (whose western areas in fact have no stations), the tracking of weather systems in the plateau by means of conventional meteorological data is difficult, and satellite cloud pictures provide an important tool for weather analysis and forecasting for the plateau. Experience indicates that satellite weather maps are useful in tracking the movement of weather systems, distinguishing their development and determining their structure.

The Tibetan Plateau soars into the middle troposphere above South Asia and is surrounded by mountain chains. In the past our country's meteorologists believed plateau weather was different from plains weather. For example, on the plateau they frequently observed cumulus clouds, while stratus clouds were quite uncommon. They also believed that in the winter, cold waves and cold and warm front activity were uncommon on the plateau. Satellite cloud pictures show that this is not the case at all. We have discovered that just as in the plains, weather changes in the plateau result primarily from the passage of weather systems. The period from October to May is the plateau's dry season, and in this period a high-altitude trough generally moves eastward across the plateau from Central Asia, and cold waves and front activity usually appear over the plateau. It is not common for the plateau to intersect a cold vortex, but this can occasionally happen, and Fig. 1 [not reproduced] is an example of activity by a high-altitude westerly trough. The high-altitude trough system on the plateau did not manifest itself in a comma-shaped cloud formation as at sea, but in the form of a curled cloud belt running north and south. When this high-altitude trough moved to the middle and lower reaches of the Yangtze River on the next day, it produced severe tornado weather. Satellite cloud picture analysis makes it clear that cold waves usually enter the plateau from the northwest, and as the cloud fronts move in a southeasterly direction they sometimes produce snowfalls over large areas of the plateau. Fig. 2 [not reproduced] shows a warm front cloud system on the plateau; the multilayered structure of the warm front cloud system is quite clearly visible. Analysis of data from two air monitoring stations on the east of the plateau shows that this was indeed a warm front. In the past, there was disagreement among meteorologists as to whether there were warm fronts on the plateau, but satellite cloud pictures have indicated that there is indeed warm front activity there. Stationary front clouds can span the entire plateau. The spiral structure of the intersecting cold cyclone cloud system is clearly visible. During the dry season, most of the cloud systems on the plateau are high cloud, and when analyzing weather systems infrared cloud maps are more useful than those made in the visible spectrum.

The period from June to September is the wet season on the plateau, and during this season the Indian summer monsoon can enter the plateau. Rainclouds are extremely frequent on the plateau. Sometimes cloud systems from the Indian monsoon low can cross the Himalayas and extend into the plateau. Fig. 3 [not reproduced] shows such a cloud system; the low is moving westward along the Ganges River and the low pressure cloud system extends onto the plateau, creating a strong precipitation process in its southern part.

The Bay of Bengal tropical cyclone can also influence the plateau's weather. When storms move into India, if the high-altitude trough is also passing through, the cloud systems associated with these two weather systems combine, generally producing heavy precipitation on the plateau. On 12 October 1973 a storm cloud system from the Bay of Bengal combined with the high-altitude trough cloud system on the plateau, producing a record snowfall over a large area of the southern part of the plateau. The Pali [1584 6849] station in the southern part of the plateau (55773) reported a precipitation of 121 millimeters in 24 hours.

Tropical cloud upwellings [yunyong 0061 3196] sometimes also affect the plateau. Satellite cloud pictures indicate that when an upper-air trough is developing in Pakistan and the Arabian Sea and the trough line extends below 20° N, a large quantity of water vapor and clouds wells up from the Arabian Sea into higher latitudes, affecting the subtropical zone's or even the westerly zone's weather. On 27-29 November 1972, an upwelling process developed in the Arabian Sea. It originated in the equatorial region of the Arabian Sea, and a broad cloud belt passed over the plateau, stretching as far as 40° N. Analysis of satellite cloud pictures and conventional meteorological data made clear the position of the associated 200 millibar contour map and the high-altitude jet stream. This upwelling produced a blizzard over a large area on the plateau, leaving snow which still had not melted a month later.

In early years, meteorologists on the plateau believed that owing to the barrier of the Himalaya Mountains, the Indian monsoon low and the Bay of Bengal's storms had no effect on the plateau's weather; nor did they know that tropical upwellings coming from the Arabian Sea affected it. Sometimes a major blizzard would occur on the plateau, and no one knew what weather system had produced it. Only when satellite cloud pictures became available did we know that the tropical weather systems south of the plateau affected its weather.

2. Using Satellite Data To Observe Maritime Weather Systems

We use satellite cloud pictures to observe maritime typhoon activity. During 1970-1973, we used the classification of Fritz et al. [1], and thereafter we used the Dvorak [2] method, to calculate typhoon intensity and possible development. These methods use as primary criteria the scope of the dense cloud region of the typhoon and the curvature characteristic of the cloud cover. Several years' experience with them indicates that typhoons of the same intensity may differ widely in cloud shape and quantity. Accordingly there are some difficulties associated with using only the size of the heavy cloud area and the cloud shape characteristics from satellite cloud pictures to estimate typhoon intensity. Recently we have used infrared cloud maps from the 1978 stationary satellite to develop a method of estimating the intensity of tropical cyclones which takes account of the size of the central strongly convective cloud region [3]. We have used four cloud system characteristics--

the size of the central strongly convective cloud region of the tropical cyclone, the position of the center of circulation relative to the strongly convective cloud region, the shape and size of the eye, and the number of circles in the spiral cloud belt--as factors governing tropical cyclone strength. By combining these four factors we obtain an overall strength number for tropical cyclones. Fig. 4 gives the curves relating the overall strength index T for a tropical cyclone to the maximum wind strength at the center. These can be used to estimate the strength of a tropical cyclone.

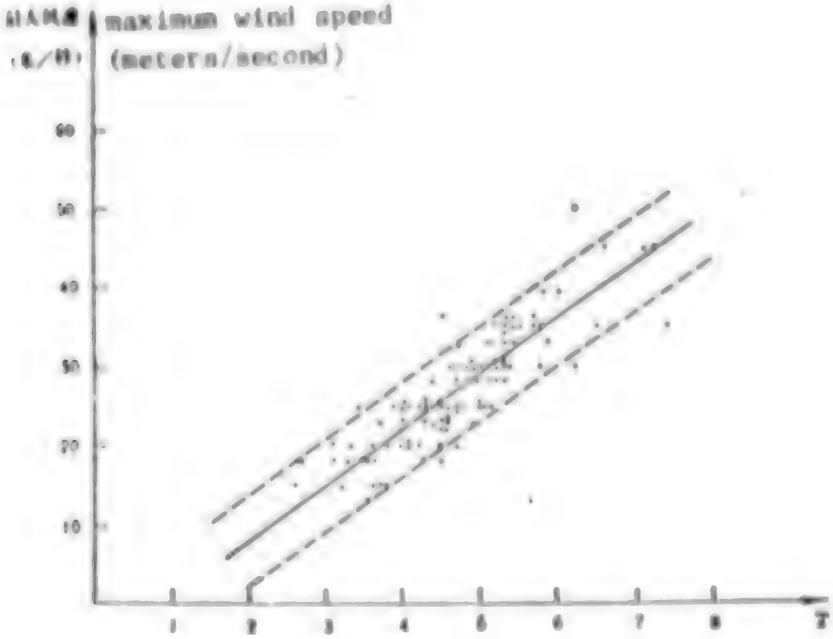


Fig. 4. Relationship of overall tropical cyclone intensity to maximum wind strength at center.

Satellite cloud maps can be used to monitor the activity of other tropical disturbances on the seas; some of these disturbances cannot be analyzed with conventional data. Sometimes, when these disturbances reach the mainland, they can produce heavy rains or high winds [4]. The satellite cloud map for the morning of 21 August 1977 (not reproduced) shows two small cloud masses 200 and 600 kilometers east of Shanghai on the ocean, 100 km north of typhoon No 7707, and moving west at 20 km/hr. The cloud picture for 1900 hours on the 21st shows these two cloud masses already nearing the coast. When they passed over Shanghai, the city had a record-breaking thunderstorm. The precipitation during an 8-hour period was 540 mm. The precipitation in a 1-hour period reached 150 mm. This cloud mass on the outskirts of the typhoon showed up very small on the satellite cloud picture, and there was no way to use conventional marine data to analyze it; at present all we can do is monitor such cloud masses on cloud pictures.

Sometimes a typhoon has been followed by a weak tropical disturbance, and after the typhoon has reached land and people's vigilance has slackened they have not monitored the following disturbance and have experienced a second period of heavy rain. Satellite cloud pictures are useful for monitoring such disturbances. At 1400 hours on 23 July 1978, typhoon No 7805 had already come over land south of the mouth of the Yangtze River, but tropical cloud mass A was following behind the typhoon at 25° N and 126° E. At 0800 hours on 25 July (Fig. 5) [not reproduced], when the typhoon had already moved on to North China, tropical cloud mass A reached land in southern Zhejiang, producing heavy rain. The maximum 24-hour precipitation was 210 mm.

Since May 1978 we have been using data from the Japanese synchronous satellite for daily weather analysis and forecasting. Because considerable information is produced daily by this satellite, it serves as an especially useful tool for our monitoring of the activity of weather systems at sea.

3. Using Satellite Cloud Pictures To Analyze Front Structure

Satellite cloud pictures can help us analyze front structure [5]. On 5 February 1974, a cold front was present on the South China coast, moving very slowly (Fig. 6a). From longitude 110° E westward, the front consisted entirely of low cloud: although it appeared quite white on the cloud picture taken in the visible spectrum, it showed dark gray on the IR picture. East of 110° E was an area of medium-level clouds (Fig. 6b); from the structure of the cloud system it can be seen that the cloud layers above this cold front were relatively thin, so we inferred that above the inversion layer there was an additional subsidence inversion layer. Fig. 7 is a vertical cross section of the front from north to south. It can be seen that in the lower half of the convection layer above the frontal surface there are two inversion layers, with the frontal inversion layer appearing at about 800 millibars and an additional subsidence inversion layer at 600 mbar; accordingly the frontal surface cloud system is limited to medium and low cloud.

Weather from the Kunming quasistationary front is frequent in Yunnan and Guizhou during the winter. The front is generally located between Kunming and Guiyang, and it is of a warm type with very thin cloud cover. On 5 February 1974 (Fig. 6a) the Kunming quasistationary front was also present. It can be seen from a section (not reproduced) running east and west through the front that its gradient is very small and that in addition there are two inversions. On the satellite cloud picture (Fig. 6b) the Kunming stationary front is located at the edge of the western part of the clouded area.

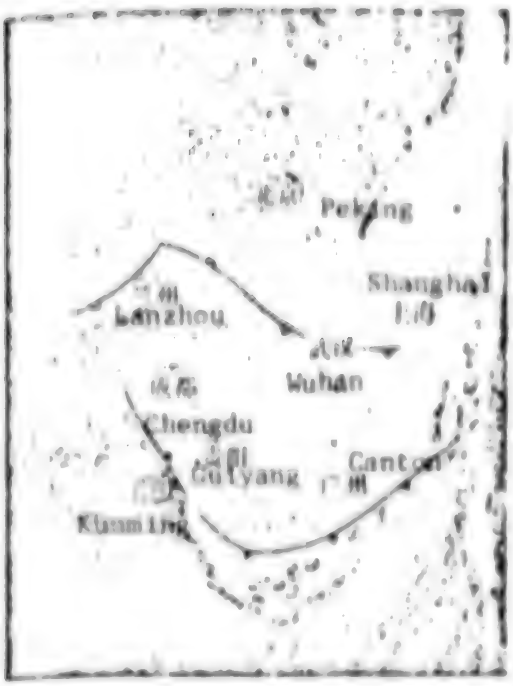


Fig. 6a. NOAA-3 very-high resolution visible-spectrum cloud picture for 5 February 1974.

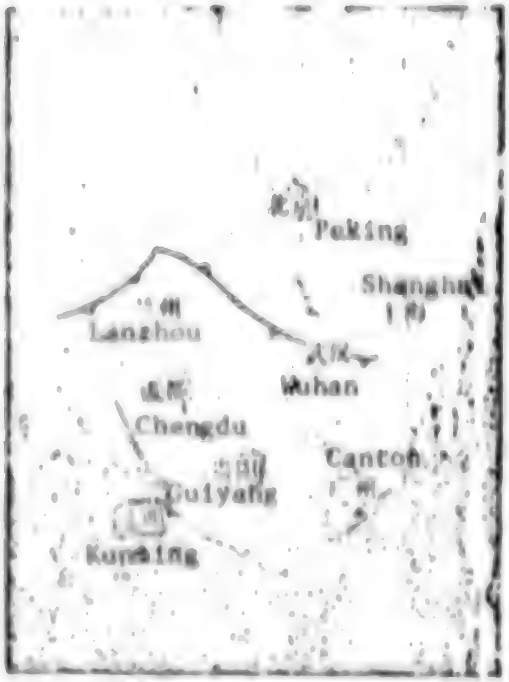


Fig. 6b. NOAA-3 very-high resolution infrared cloud picture for 5 February 1974.

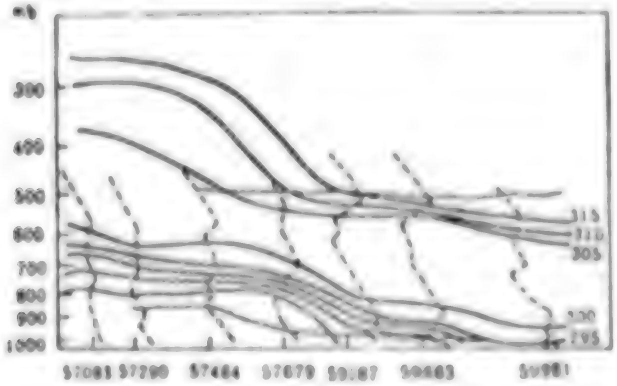


Fig. 7. North-south vertical section along 115° E at 0800 on 5 February 1974.

In the winter, there is a subsidence inversion above the South China quasistationary front and the Kunming quasistationary front; the cloud picture shows relatively thin cloud cover. This is a characteristic of the South China stationary front, and is related to the presence of the plateau. In winter the plateau is in the westerly belt, and after airflow passes the plateau and sinks down its eastern slope, it forms a subsidence inversion in the middle troposphere and suppresses vertical development of the frontal cloud system.

In Fig. 6, the visible and IR cloud pictures both show a weather system A on the middle and lower reaches of the Yellow River which in terms of cloud structure seems to have an occluded front [Pengnuanfeng 0397 2541 6912] structure. But on the original sea-level weather map the occluded front was not distinguishable, and key surface indications were also unclear, showing only a low pressure trough extending north and an area of snowfall. But this frontal system did indeed exist. A vertical section along 25° N latitude (not reproduced) makes it clear that in the middle troposphere both cold and warm front regions are present, with a low frontal surface gradient, while in the lower troposphere there is a cold air cushion; this is an upper air frontal system, and with the satellite cloud pictures we can distinguish the structure of the frontal surface and improve the analysis of the sea-level weather map.

4. Use of Satellite Cloud Pictures To Analyze Heavy Rains and Thunderstorms on the Mainland

Very-high-resolution IR cloud pictures are very effective in determining the heavy precipitation regions associated with the summer Plum Rains front [6]. The high-resolution IR cloud picture for 22 June 1976 shows several light cloud areas A, B, C, D and E (Fig. 8) in the frontal cloud belt; they are analyzed as corresponding to five strong precipitation centers on the 24-hour precipitation map for 21-22 June 1976.

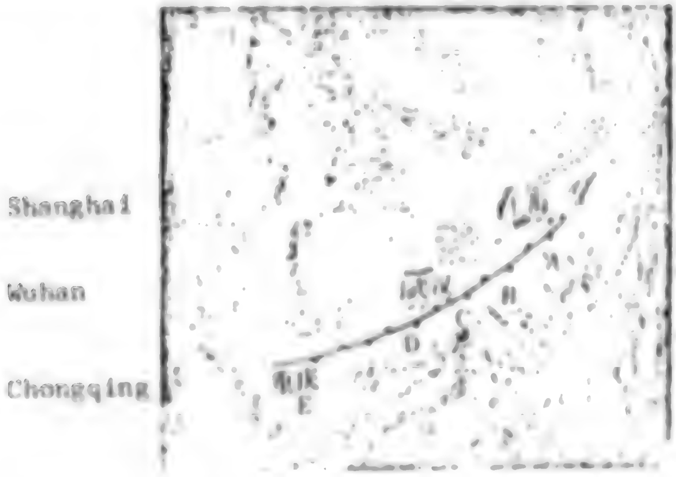


Fig. 8. NOAA-4 high-resolution infrared cloud picture for 22 June 1976. A, B, C, D and E are medium-size rain areas along the Plum Rains front.

In 1974-1975 we subjected the signal from the NOAA satellite IR scanner to computer processing to investigate the relationship between the brightness of the IR picture and the amount of precipitation from the Plum Rains front [7]. The IR information received from the APT system was analyzed into 64 degrees of brightness (0 through 63) and analyzed by computer, producing a digitized cloud map. This digitized cloud map data was analyzed together with the corresponding 6-hour precipitation figures and summarized in the form of a relationship between relative brightness and amount of Plum Rains front precipitation during 6-hour periods (Fig. 9). On the basis of this empirical relationship we can use the IR cloud picture data to determine the amount of precipitation during a 6-hour period on the Plum Rains front. The actual cases indicate that the areas with brightness above 40 on the digital IR cloud map correspond to areas of heavy precipitation from the Plum Rains front. Areas with brightness above 48 correspond to areas of extremely strong precipitation. The estimated precipitation by areas largely corresponded with the actual situation. Because we do not have a large computer, this experiment cannot yet be used in day-to-day weather analysis.

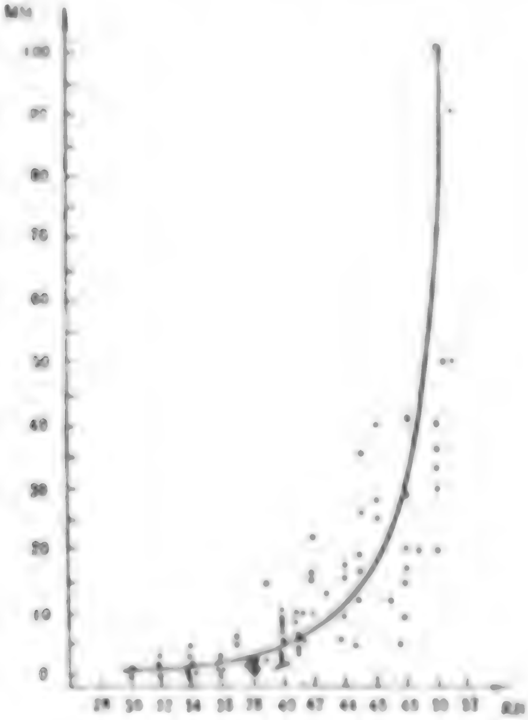


Fig. 9. Plot of Plum Rains front 6-hour precipitation against relative brightness (RB).

Heavy rains in China mostly result from very slow moving, highly persistent squall lines. Such squall lines can be distinguished on the satellite cloud pictures. On 7 August 1975, after typhoon No 7503 reached land and entered Henan, a 24-hour rainfall of 1,060 mm occurred, producing serious flooding. Fig. 10 [not reproduced] is the IR cloud picture at the time of the heavy rains. Point A is the location of the heavy rains. The region in which the heavy rains occurred is to the east and northeast of the center of the typhoon. East of the area of heavy rains is a very slow moving cold front, behind which is extremely humid air with strong low-pressure east winds, while the humid southeasterly winds ahead of the front are blowing toward the heavy rain area. This air mass is in an unstable position. On the west side of the region of heavy rains is a mountain range which is largely at right angles to the east wind circulation and which causes the moist air to rise, release its potential-energy instability and commence strong convective activity. The hourly precipitation map (not reproduced) shows strong precipitation centers developing on the southeast of the heavy rain region, moving northwest and entering the heavy rain region, producing a quasistationary precipitation system in the rain area. Synoptic observations indicate that in the heavy rain region the weather phenomena were extremely frightening, with continual thunder and torrential rain so heavy that it seemed to threaten people with suffocation. The satellite cloud picture (Fig. 10) shows many small convective cloud belts to the east of the thunderstorm center converging on the region of heavy rains. These strong convection cloud belts correspond to the path of movement of the center of the rain area on the hourly precipitation map. If geosynchronous satellite photographs had been available at the time, they would have been even more effective in monitoring these extremely heavy rains.

The life history of summer thunderstorm weather is relatively short, and the use of a satellite in polar orbit makes it difficult to grasp its activity. Cloud pictures from geosynchronous satellites, however, make possible relatively good tracking of the activity and development of such systems. On the afternoon of 9 June 1978, thunderstorms, high winds and hail developed in the North China area. These occurred in the northern part of North China under the influence of a cold vortex in the upper air. At 0800 (Peking time) on 9 June the geosynchronous satellite cloud picture (not reproduced) showed the vortex center located near 44° N, 115° E; a cold front cloud system associated with it was already located along the east coast and the vortex was followed by a large area of clear air. At 1100 on the 9th (Fig. 11a) [not reproduced], to the west of the vortex center in a band at 43° N, 110-115° E convective belt AB had already begun to form; the cloud tops were not high and the IR picture showed gray. By 1400, convective cloud belt AB on the northwest of the low altitude vortex was further developing into a relatively curved squall line. On the surface map for 1400, the area corresponding to the squall-line cloud system was an area of thunderstorm activity. At 1700 (Fig. 11b) [not reproduced] the convective cloud belt was continuing to move southeast and intensifying. Its frontal edge was bright and formed an arc which bulged to the southeast; when the surface winds at the arc-shaped cloud line passed, the wind direction was at right angles to the arc. At 2000 the arched cloud line AB was developing into an oval-shaped overcast region and had turned eastward, moving toward the northern shore of the Bohai, while at 2400 it was decreasing in intensity and was in a dispersing condition, with its direction shifting toward ENE. This convective cloud bank produced widespread thunderstorms, hail and high winds in the northern part of North China between 1400 and 2000 on 9 June.

When an upper air cold vortex stops over North China, the abovementioned process can recur daily, so that certain areas in the northern part of North China have a thunderstorm every 12-18 hours. Several medium-sized disturbances emanate from the upper-air cold vortex. These disturbances do not show up clearly on an isobaric contour map; on a temperature map they do show up as a small cold trough, but they generally go unnoticed. Satellite cloud pictures, however, show them at a glance, and the geosynchronous satellite cloud pictures can effectively track the activity of such medium-sized disturbances.

5. Conclusion

In this article we have summarized the various uses of satellite data in weather analysis and prediction. We used primarily APT system data from satellites in polar orbit; since 1978 we have begun using data from geosynchronous satellites. Our experience indicates that satellite data offer a valuable tool for weather analysis and prediction, particularly in areas where other data are scarce. Hereafter, by using data from stationary satellites we will become able to gain a more profound understanding of certain weather systems affecting China and will be able to do better weather analysis and prediction.

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8480
CSO: 4008

APPLIED SCIENCES

COUNTRY'S LARGEST GEOLOGICAL MUSEUM TO REOPEN 1 MARCH

OW281004 Beijing XINHUA in English 0826 GMT 28 Feb 80 OW

[Text] Beijing, February 28 (XINHUA)--China is to reopen its largest geological museum in Beijing on March first, an official of the museum said today.

Located in a downtown district Xisi, the museum was built in 1958, opened to the public the next year and closed during the cultural revolution. On display in its 6 pavilions now are some 10,000 items, including samples, medals, maps and charts related to geology and palaeontology.

On show in the mineral resources pavilion are samples of tungsten, tin, molybdenum, antimony, mercury and coal, ores with major reserves in China. There are samples of rare metal and non-metal ores and petroleum samples from 21 provinces, municipalities and autonomous regions including some taken from Taiwan and the South China Sea.

The stratum palaeontology pavilion has some 1,500 fossils taken from various periods since late precambrian era, some of which are unique.

On view in the Chinese mineral deposits pavilion are objects and charts illustrating formations of over 190 different ore beds across the country. This provides visitors with an overall conception of the varied and rich mineral resources in China.

Also on display are a large number of maps illustrating basic geological research. Included are a geological map of Asia to a scale of 1:5,000,000 and a geological map of China at 1:4,000,000.

CSO: 4020

APPLIED SCIENCES

FIRST AUTOMATIC MARINE FLOAT DEVELOPED

OW160716 Beijing XINHUA in English 0708 GMT 16 Mar 80 OW

[Text] Beijing, 16 Mar (XINHUA)--"South Float-1," China's first automatic float for marine hydrology and climate surveys, has been operating well since it was launched east of Hainan Island last October, according to a spokesman for the Chinese Academy of Sciences.

The equipment sustained the test of gales since then, he said, and nothing went wrong.

With a digital remote control system and various built-in sensors, the float is capable of measuring automatically the current velocity, direction, water temperature, salinity, wave height and time period as well as the wind direction and its maximum and mean velocity at sea level. It can also indicate the location of the air temperature float and the maximum instantaneous tension.

The float transmits all these data back to the reception station in Guangzhou 500 kilometers away, where they are handled by computers and converted into commonly understandable printouts to be used by the departments concerned. The working process can be changed upon the command of the reception station.

The float was developed jointly by researchers at the institutes of oceanology, South Sea oceanology and automation under the Chinese Academy of Sciences. All its materials and electronic components were made in China.

A recent appraisal by the experts has proved that the marine float is up to all the specifications, the spokesman said.

CSO: 4020

APPLIED SCIENCES

STANDARDIZATION IN SHIPBUILDING INDUSTRY CALLED URGENT TASK

Shanghai CHUANBO GONGCHENG [SHIP ENGINEERING] in Chinese No 3, 1 Nov 79 pp 62-69

[Article by Cheng Tianzhu [4453 1131 2691], "Standardization--An Important Integral Part of Scientific Management in Shipbuilding Industry"]

[Text] Foreword

During the 30 years that have passed since liberation, our nation's shipbuilding industry has garnered tremendous achievements, but it is still greatly outdistanced by the advanced shipbuilding countries of the world. In the new long march toward the goal of the four modernizations, the shipbuilding industry faces an extremely honorable and arduous task. If our nation's shipbuilding industry is to show rapid growth, much work has to be done. Most important and most urgent among the tasks to be done is an effort to bring about scientific management in our national shipbuilding industry.

The scope of scientific management is very broad. This article seeks principally to discuss the role of standardized procedures in the scientific management of shipbuilding, to present concisely the current state of standardized practices in shipbuilding, and to put forward some incompletely formed ideas and suggestions about standardization as it relates to the realization of scientific management for the shipbuilding industry.

I. "Standardization" Is an Important Means for Organizing a Modern Shipbuilding Industry

"Standardization" is an important means for organizing a modern shipbuilding industry and an important integral part of scientific management. A good job of "standardization" can play an important role in the accelerated growth of the national economy, in improving the quality of industrial and agricultural production and construction, and in increasing the productivity of labor. "Standardization" is, at the same time, an important measure for the development of the shipbuilding industry.

Modern production is founded on the highly effective production that stems from advanced technology, strict division of labor and wide-ranging cooperation. The shipbuilding industry and shipping products touch upon countless enterprises and numerous sectors. According to incomplete statistical data, the full complement of equipment for a 25,000-ton merchant ship runs to 5192 items, totaling 9053 pieces and requires 804 items weighing over 8,000 m. tons of materials.

This requires that the shipbuilding industry maintain a high level of integration and complete coordination with the production activity of the society as a whole. In accomplishing this, standardization plays the role of an indispensable technological link. Standardization itself begins with scientific management and work objectives and proceeds to the formulation and implementation of various technical standards, organically relating in a technical way all sectors and links in research, design, production, testing, and use to form an integral whole to assure that production and construction proceed in an orderly way. And it is this integration and orderliness that is most needed and most difficult to realize in making a shipbuilding industry that is a multiple-purpose industry.

The level of "standardization" is a yardstick for measuring the technological level and the management level of a country's production. "Standardization" is a major indicator of modernization and it is also an important indicator of the modernization of the shipbuilding industry. Without standardization, modernized production cannot go forward; without standardization, there can be no specialization and thus no high speed and no high quality. By the same token, unless the shipbuilding industry strives to enhance standardization, there is no use imagining that the goals of modernization, specialization, high speed, and high quality can be attained.

Ever since the late 1960's and more particularly since the beginning of the 1970's, great changes have taken place internationally in the concept of "standardization" with the development of "standardization" entering a new historical stage. This stage has been characterized by an internationalization of standards. Myriad experts in various fields annually engage in international standardization activities. "Standardization" and "international standardization" are being given more and more attention by governments, commercial trading organizations, research organizations, and the industrial sector. "Standardization" has developed throughout the world into a rising multifaceted science to become an important branch of modern science. "Standardization" has already transcended the boundaries of pure science or pure scientific technology to become a bridge that links the three elements of scientific research, production, and use and is rapidly developing to meet existing needs and open a way to the future.

More than 300 international organizations engaged in technical work now belong to the International Standards Organization (ISO). The Shipbuilding Technology Committee (TC8) of the International Standards Organization is also very active with participating countries deriving differing degrees of benefit from its international standardization activities.

More than a hundred countries in the world have set up national standards organizations, and more than 70 countries have formulated national standards. Some countries that have a highly developed shipbuilding industry give extremely close attention to standardization work, and Japan gives exceptional attention to standardization work in the shipbuilding industry.

After analyzing the reasons for the high productivity of Japanese shipbuilding, it is not going too far to conclude that "standardization has been the driving force behind the Japanese shipbuilding industry." The view universally in Japanese shipbuilding circles is that progress in the shipbuilding industry depends not only on technological growth but also on specialized production and standardization of output with a transition from the construction of individual units of numerous kinds to assembly line construction. By combining companies and refurbishing old plants, and through division of labor among each shipyard, Japan has transformed its production system from diversified production of numerous varieties of ships to specialized production so that each yard builds only ships and boats of a few kind that are more or less the same size, or only a single kind of ship. In this way the shipyards can set up a stable production line with benefits for the use of advanced technological processes and equipment, with benefits for increases in technological levels, and with benefits for improved productivity. At the same time, each shipyard bolsters the standardization of its output and strives to develop in the direction of standardized ships produced by assembly line methods. Most of the ships produced during the past several years by several shipyards have been standard ships. This is also an important reason why Japan's shipbuilding industry is able to occupy an advantageous position in this internationally fiercely competitive industry.

2. The Past 30 Years of Standardization of the Shipbuilding Industry in Our Country

In the old society of our country, standardization of ships was entirely out of the question.

Following liberation, along with the growth of the shipbuilding industry and the extension of standardization work throughout the country came the gradual development of standardization in ships. As of 31 December 1978, our national shipbuilding industry met current national standards or partial standards for 907 items. This standardization work played an important role in strengthening management of enterprises, improving quality of output, shortening design time and time required to build and repair ships, in reducing costs, in the organizing and consolidating of specialized production, and in coordinating overall relationships. It promoted the growth of the shipbuilding industry and provided a fairly good foundation for the further development of our national shipbuilding industry and for standardization work in shipping.

Growth of standardization of ships in our country has passed through the following several stages:

Prior to 1956 a mixture of foreign standards with production following individual production methods for single ships and single machines. At that time several enterprises began "standardization," but this was fairly decentralized and lacking in central leadership.

In the period following 1956, growth of our national shipbuilding industry was quite rapid because it was already clearly seen that it would not do not to standardize. Overall standardization in our national shipbuilding industry began in 1956 and continued into 1960. During this stage we depended chiefly on formulating national standards on the basis of foreign standards.

1961-1963. A reaffirmation of existing standards accompanied by study and formulation of standards suited to the situation in our own country.

The post-1963 period in which standardization work again entered a rather smooth stage of growth. This stage lasted until about 1966.

But between 1966 and 1973, ship standardization work virtually ceased; standardization organizations were forced to disband, large amounts of data were scattered and lost, and most standards personnel went into other occupations.

The post-1973 period. Thanks to the profound concern of leading comrades on the Central Committee and the State Council and given the efforts of ship standardization work personnel and the support of the broad masses of shipbuilders, ship standardization work once again reached a high tide. In 1973 the All China Ship Standardization Work Conference was convened and established the Ship Standardization Committee, set up a unit for personnel returning to the ship standards profession, approved administrative methods, and formulated a work plan, but though it registered some accomplishments, numerous obstacles prevented its rapid expansion.

The post-1976 period. Thanks to the high regard for standardization work on the part of the party Central Committee headed by Chairman Hua, an excellent situation developed in standardization work, but some problems urgently requiring solution still existed in the development process.

most notably how to apply "standardization [illegible] raising scientific management levels, which urgently [illegible] from study and solution.

Though there have been some achievements in [illegible] standardization work during the past several years, experience [illegible] that there are still difficulties in forging ahead.

A look at the detailed 844 items that [illegible] and partial standards (see Table 5) shows that [illegible] needs are satisfied in an overall way. In designing [illegible] standardization may reach a use coefficient of 70 or 80 percent [illegible] with a medium level of technology using existing standards [illegible] working drawings can build an ordinary ship without much difficulty. It would be unthinkable at the present time to disregard standards in designing and building a ship.

Table 5. Statistics on Existing Standards [illegible]

Category	Series	[illegible] A/Z	Total
0.	Technical terms, signs and symbols	[illegible]	
	Drafting management system	[illegible]	
	Design and model management	[illegible]	39
1. Ships, overall	Design, computation methods	[illegible]	
	Installation and testing	[illegible]	
	Hull construction and appurtenances	[illegible]	43
2. Ship equipment	Mooring equipment	17	
	Deck machinery	[illegible]	
	Cranes and hauling machines	11	
	Deck equipment	[illegible]	
	Lifesaving equipment	12	
	Other	[illegible]	122
3. Ship equipment	Basic structures	[illegible]	
	Facilities and utensils for living	[illegible]	
	Sanitary equipment for galley	[illegible]	
	Furniture	[illegible]	46
4. Principal auxiliary machines	Boilers	[illegible]	
	Body of engine and components	[illegible]	
	Various kinds for engine and auxiliary [illegible]	[illegible]	
	Internal combustion machines	[illegible]	
	Other auxiliary machines	[illegible]	
	Shaft systems	[illegible]	42

(continued)

Table 1. (continued)

Category	Series	GB CB CB/Z CB*CB*/Z	Total
5. Ship pipe fittings	General standards	6	
	Valve bodies	83	
	Brake valves and cocks	17	
	Ventilation accessories	35	
	Pipes	70	
	Communications remote control and control accessories	23	
	Hydraulic pressure components	5	
	Other accessories	26	265
6. Electrical equipment; navigation and communications equipment	General standards	2	
	Electrical machinery and chemical power sources	3	
	Electrical equipment controls	8	
	Lighting devices and electric heating devices	18	
	Electric power distribution equipment and electric current measuring instruments	8	
	Navigation equipment	19	
	Communications and observation equipment	14	
	Standardizing items and installation items	69	
	Other	5	146
7. Special devices			13
8. Industrial arts and industrial art devices	Rivetting and welding tools	20	
	Heating processing tools	28	
	Machining, fitting, and electrical tools	20	
	Protective and cleanliness inspection	20	
	tools	4	
	Gripping tools	4	96
9.	Other	3	3
TOTAL			907

The process of implementing standardization has given vigorous impetus to specialized production. Statistical figures from Shanghai show that of 497 products for ships being standardized, 307 standard items meeting 1903 types of specifications were being produced at fixed points by 112 separate units, and this is extremely important both in insuring implementation of standardization and in deriving the economic benefits of standardization. There can be no doubt whatever that standardized products and specialized production free the productive forces of final assembly plants. For example, the large icebreaker, "Haibing 101," designed and built by the Qiuxin Shipyard, required a noticeably shorter time for designing and building because of national standards, ministry-prescribed standards, and standards of the enterprise. When that same shipyard designed and built the survey ship "Binhai 502" 2 years ago, when standardization was not yet being well applied, construction time was clearly lengthened. Table 2 shows a comparison of the two ships.

Table 2. Comparison of Standardization and Design and Construction for Two Ships

	Haibing 101	Binhai 502
Tonnage	3200	700
Number of special purpose drawings (sheets of paper)		
Hull	302	458
Turbines	358	726
Electricity	277	261
Total	937	1445
Design time	2 months	18 months
Construction time	8 months	16 months

The economic benefits of standardized products produced by specialized plants are even more striking, but lack of space does not permit a full account.

However, the work of standardizing products and their specialized production is still inadequate. It may be seen from statistics for standard items used for construction of 26 different types of ships at 9 shipyards (see Table 3) that more than half the standard items were manufactured by the shipyard itself. Furthermore, incidents such as the following have taken place: Though there has been fixed point production of some standard items, measures have not been implemented to permit the factories at fixed points to supply parts on time. Systems in effect at some fixed point plants differed with each one going its own way with no agreement on goods, so that there was overlapping with small amounts being produced at low efficiency and high cost.

Table 3. Sources of Standard Parts for Nine Shipyards

Member Units Participating in Standard Cooperating Organization	Made by Yard Itself		Obtained Elsewhere	
	No. of ship items	No of types & specifications	No. of ship items	No. of types & specifications
Jiangnan Shipyard	139	521	95	711
Hudong Shipyard	88	304	54	650
Shanghai Shipyard	78	420	75	439
Zhonghua Shipyard	92	299	66	664
Qiuxin Shipyard	167	671	73	359
Donghai Shipyard	106	217	57	175
x x x x	46	128	28	187
Shanghai Fishing Boatyard	32	68	29	108
Lixin Shipyard	6	224	10	43
Totals	302	1947	207	1903 [sic]

Additionally, a look at statistical data for six shipyards and one design institute that implemented standardization of ship products shows a rather large proportion of items as having been standardized (72.8 percent) (See Table 4). But the proportion of types and specifications that have been standardized is very low (27.1 percent). This both demonstrates that implementation of standardization has not been vigorous and that the standards have not been sufficiently high and have not been geared to production realities.

Table 6. Statistics Showing Implementation of Standardization of Products for Ships

Number of items for which standards exist	49
Number of items standardized	362
Percentage of standardization	72.8%
Total number of standard types and specifications existing	9858
Total number of types and specifications implemented	2671
Percentage of implementation of standard types and specifications	27.1%

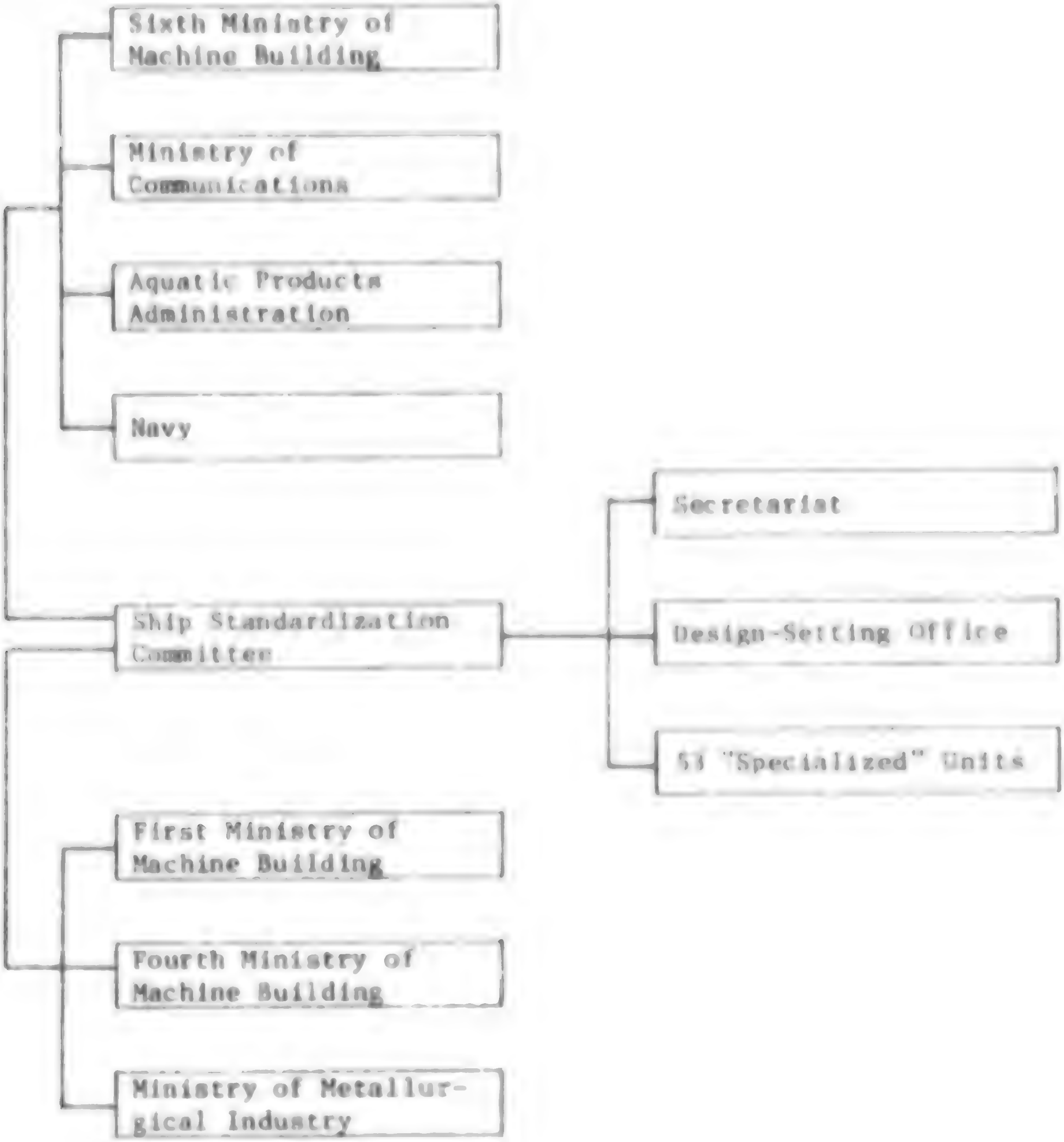
3. Use of Standardization Concepts to Manage the Shipping Industry

In addition to the narrow standardization work done in formulating standards and implementing standards, the shipbuilding industry has begun during the past several years to use standardization concepts to solve some management problems in the industry. The general situation at the present time shows: a good beginning, gratifying achievements attained, and full demonstration that standardization is an important integral part of scientific management, but numerous problems still await study and solution. The discussion that follows begins with the establishment of the organizational structure.

In 1974 the State Council approved the recommendations of the All China Ship Standardization Work Conference and established standardization committees in the Sixth Ministry of Machine Building, in the Ministry of Communications, in the Aquatic Products Administration, and in the Navy. Working under the leadership of the State Planning Commission, vested with authority by pertinent ministries and under the guidance of the State Bureau of Standards, these committees used their super-departmental organization to lead nationwide ship standardization work. Later on, the State Planning Commission further designated the First Ministry of Machine Building, the Fourth Ministry of Machine Building, and the Ministry of Metallurgical Industry to join the Ship Standardization Committee so as to jointly work on ship standardization work. Since ship standardization work was conducted on a unified basis throughout the country, the depth and breadth of the sphere of its work was sufficient to become an important ingredient of overall shipbuilding planning, therefore a good job of ship standardization work could play an important role in the promotion of good work in overall shipbuilding planning. The establishment of the Ship Standardization Committee was the first step in overall planning for shipbuilding, and it aroused attention in all quarters and received broad support.

Under the Ship Standardization Committee were established 53 specialized technical units, including those for various types of ships, various types of powerplants, various auxiliary machines used on ships, various observation, communications, and navigation equipment, shipboard electrical technology, theoretical study of ships, manufacture and use of electronic computers, and various shiploading equipment and machinery. These units were transdepartmental and transregional; consequently it was relatively easy to organize the pertinent specialized scientific and technical units and start work.

The organization of the Ship Standardization Committee is shown in the following chart.


Sixth Ministry of Machine Building
Ministry of Communications
Aquatic Products Administration
Navy
Secretariat
Ship Standardization Committee
Design-Setting Office
53 "Specialized" Units
First Ministry of Machine Building
Fourth Ministry of Machine Building
Ministry of Metallurgical Industry

For the past several years the results achieved in scientific management through the work of the Ship Standardization Committee have been inspiring.

In the selection of ship types for example, once the Ship Standardization Committee had organized the various parties concerned in a thoroughgoing and wideranging study, they selected, from among the original more than 1,200 ship types, 167 ship types that can satisfy the requirements of users to become the ships that would be batch produced, and following approval of the State Planning Commission, these have been designated the table of ship types.

With the institution of the ship type tables during the past several years, not only have blind increases in ship types been brought under control, but a lot of old and out-of-date ship types have been winnowed out for a rapid reduction in ship types produced by most shipyards and a remarkable increase in batch production. Shipyards in Guangzhou, which formerly produced 30 or 50 types of ships annually, averaged production of only one and one-half ships per year. In recent years, the reduction of ship types being built to only seven or eight marks the first stage in a change from the out-of-date methods of producing single ships and single engines.

A look at the Zhonghua Shipyard shows annual production in former years to have been 28 to 34 different ship types. Dredgers alone were made in 20,40,60 and 350 cubic meter hydraulic types and in 120 and 350 cubic meter grab types. Tugboats were 400,480,540 and 900 horsepower types. Following institution of the ship type table, a rapid reduction to 14 different ship types for building each year took place; now only nine different types are built with further reductions in view for the future. After the Zhonghua Shipyard settled on a 400 horsepower tugboat from among the several nearly identical tugs it had been building, it derived the following benefits:

1. Construction period was shortened from 400 days to an average 115 days or only 29 percent of the previous construction period. The construction period for the first ships produced after deciding on the types was 132 days, but this was later reduced to 70 days for a 47 percent shortening in the time.

2. Costs fell. Before the fixing of types, the price was 760,000 yuan out of the shipyard; following fixing of types, it was 580,000 yuan for a 25 percent decline.

3. In order to batch produce fixed types, new technologies and new techniques such as photoelectric cutters, laser scribers, and "no-excess" assembly were used in production, so the technological production process was more rational, and quality of product rose.

4. Savings in materials and work time. In the single item of building ways, 72 tons of steel and more than 1500 man hours were saved.

Additionally, batch production of fixed types minimized much of the preparation work for production, simplified numerous inspection procedures, checking before acceptance procedures, and created beneficial conditions for improvements in management at the worksite.

Other shipyards derived greater or lesser benefits from the institution of ship type tables, as in the case of the Hudong Shipyard, for example, which built 1000 ton tankers. Before settling on types, it produced a total of eight different ships of this and similar classes. After settling on types followed by the institution of batch production, cost per vessel dropped 20 percent and labor time fell 42 percent. The Dalian Shipyard believes that by strict adherence to the table of ship types, plus addition of a few appropriate measures, their yard's ship construction volume can be turned over several times annually with an increase of several hundred million yuan in output value for the state.

The table of ship types has also served a good purpose in reshaping the entire shipbuilding industry. For example, when very large capacity 400 horsepower tugs were required domestically, more than 10 shipyards located in eight provinces and municipalities built them. But since there had formerly been no unified management, each shipyard would draw up, as part of the production process, 11 different designs with numerous different kinds of principal machines and matching equipment. The shipyards had no choice but to build ships to fit "machines" no matter that their yard's production was meagre, slow, bad, and wasteful, and no matter that numerous scientists and technicians in design departments slaved away to duplicate designs and tirelessly change blueprints. Once these tugboats had fixed types, a unified inventory of equipment and machines could be used nationwide to place orders, and unified blueprints could be used in production. In this way, not only could the shipyard produce more, faster, better, and more economically but users could also get a more satisfactory ship earlier; designers would be "liberated" from simple duplication work, and batch production by equipment plants would also be pulled together.

Simultaneous with the institution of the ship type tables was a system of "request to design alternative types" that would permit planning for and rational development of new types of ships. This had to be approved by the State Planning Commission when there was to be batch production of newly designed major ship types. Promulgation of design alternatives, though it may seem only a formality for requesting permission, was actually a means of strengthening scientific management. Where annual increases in ship times had reached 30 or 40 types in the past, now an average of only three or four alternative types were approved annually. When new type ships are excessive, not only does a waste in designing forces and an increase in difficulties in the organization of production at shipyards result, but also complicated ship types lead to no end of future trouble.

When concepts of standardization in ship types are used to effect control, the direct economic effects can run to millions or hundreds of millions of yuan, but their significance extends far beyond this. This action combines the forces of designing, producing, and use; it organizes the shipbuilding forces that are scattered throughout various departments, and this can improve management in the shipbuilding industry and make the divisions of labor more rational.

Similarly ship standardization work also saw results in the management of scientific research on ships. In the case of ship model basins for experimental work, for example, though our country has numerous such basins, they are divided among various departments. Formerly there was no communication between one basin and another, and overall planning was also difficult. Experimental techniques and experimental results showed great variation. Equipment and facilities at each model basin was more or less the same but it could not be concertedly used. Everybody has long desired organization, and once the "Ship Standardization Basin Experiments and 'Specialized' Techniques Unit" was formed, a nationwide basin system with complete facilities came into being at once. This unit has frequent academic activities and a rapid increase in learning has resulted from them. Each unit stationed at a basin has benefitted from "organization." Nowadays, division of labor among these basins is more sensible; there is a mutual exchange of technical data, a mutually complementary exchange of experimental results, and cooperative manufacture of experimental equipment. All this has received general acclaim.

But the Ship Standardization Committee also has some thorny problems to face in its standardization work, such as problems in selection of diesel engine types for use and their seriation. Currently, the seriation of diesel engines and the number of types of engines are too numerous and too complex. It is not easy to organize batch production for each series and each type of engine. The Ship Standardization Committee has organized a simplified selection, but many difficulties remain and there is no way to put forward a better considered and scientific policy that will be unanimously accepted in all quarters. Consequently, the complicated engine types and the irrational seriation problems have found no timely solution as yet. Our country does not yet have a table for marine diesel engine seriated engine types, and this is a serious problem. Additionally, standardization work has not been closely coordinated with either capital construction in the shipbuilding industry or with annual production plans; consequently, though some work falls into the category of standardization, as soon as there is any impingement on problems concerned with the production management system, it is very difficult to do anything. The result is that though the aforementioned 400 horsepower tugboats have a unified blueprint, no reduction in the number of shipyards that build them has been possible, so there has been no concentration of production and there is a limit to the application of standardization.

4. Strengthen Standardization Work and Strive for the Modernization of the Shipbuilding Industry

In the process of modernizing the shipbuilding industry, standardization work will play a greater and greater role in the future, particularly in the modernization of management in the shipbuilding industry, where there will be greater and greater need for doing a good job of standardization work as an underlying condition.

Ship standardization work in several quarters given below urgently requires solution within a short period of time:

1. Active matching of ship standardization work with industrial reorganization to assist organization of specialized production and to strive to promote a reasonable division of labor among regions and among enterprises so as to put the shipbuilding industry on the right track of scientific management.

2. Establish and perfect ship standardization organizations and experimental research bases. Especially required is further reform in the superstructure leadership structure of the ship standardization organization to make it suit and strengthen the requirements of ship standardization work.

3. Proceeding from the checking and correcting of existing ship standards, revise existing standards so as to raise their level while at the same time promulgating new standards for ships and boats to meet the needs of development, i.e.: basic standards; standards for military applications and combined civilian and military standards; general standards for ships; standards for ship propulsion; standards for ship equipment; standards for installation of equipment on ships; standards for electrical equipment on ships; standards for armaments; technological and manufacturing standards; standards for materials used on ships.

4. Full study of trends in international standards for ships with full study of international standards for ships and a setting of our own national shipbuilding policies and programs in conformity with international standards, as well as active participation in the activities of international organizations devoted to ship standardization work.

5. Strive to implement standardization in the assembly of products for ships, and continue to do a good job in the selection and fixing of types of ships, ships' machinery, and other associated equipment, and particularly in formulating the seriation and type of diesel engines to be used on ships in our country.

6. Standardization work should serve to bring about a guidance function in techniques, and should bring about a coordination between standards for

foreign shipbuilding techniques and ship products and our own technical standards and ship products so that technology that is introduced will truly help the development of our national shipbuilding industry.

At some longer time in the future ship standardization work should lead to:

1. bring our national ship standards gradually closer to international standards. All ship standards formulated can reflect new accomplishments in shipbuilding science and technology, both internationally and domestically, and be geared to our country's situation;

2. to make our country's ship industry virtually able to achieve an implementation of standardization in the production process; to implement standards for the upgrading of quality; and to make scientific management of the shipbuilding industry achieve higher standards;

3. to have written materials giving guidance for standards that can be followed in the assembly of ships and their associated equipment, rational seriation of principal machines, and standards as well as work drawings for their spare parts. At the same time the shipbuilding industry should be made to adopt a rational division of labor and specialized production at fixed points; ship standardization work should precede production and should be able to guide production;

4. a highly-skilled specialized technical corps for ships' standards and a suitable management and research organization.

Our ship standardization work should and must reach advanced world levels within this century so as to insure that whether in technical performance, quality requirements, or economic criteria, ships that we construct meet international standards.

Currently our country is in the midst of a study of reforms to its industrial system, and reform to the shipbuilding industry system is imperative. Pertinent sectors of the shipbuilding industry are mulling implementation of scientific management methods, and every unit in the shipbuilding industrial system is considering its own scientific management problems. These problems include improvements in quality, variety, and quantity, problems of how to practice conservation while producing, and problems in economic efficiency, etc. But all of these problems are interrelated with the problem of "standardization."

Conclusion

In many of the countries of the world today, science and technology are rapidly advancing and scientific management is being daily perfected, the one complementing the other to register very great accomplishments.

Scientific management requires strengthening of standardization work. If our country's shipbuilding industry expects rapid development, it must assure it through reliance on the use of scientific management methods such as standardization. The growth and improvement of standardization work in ships will greatly abbreviate the process of modernization of the shipbuilding industry. This has been already demonstrated in practice.

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LIFE SCIENCES

BREAKTHROUGH IN ARTIFICIAL ARTERIES

Shanghai JIEFANG RIBAO in Chinese 25 Sep 79 p 3

[Article by Shi Hanlu [0670 3352 1381]: "A New Breakthrough in Artificial Arteries: The First Chinese Sickroom use of Goose-Feather Artificial Arteries"]

[Text] On the afternoon of 15 August this year, in the Third Operating Room of the Shanghai Chest Hospital, people gathered together under shadowless lamps to watch with great interest the first Chinese sickroom use of goose-feather arteries.

The patient, Shi Wei [4258 0251] is a 15 year old male from Harbin. Upon opening the chest an obviously shrunken aorta was exposed. This shrunken section of the diseased aorta was three centimeters long and two millimeters wide at the smallest point. Since May of this year he lost 200 milliliters of blood from his nose and has had a sustained blood pressure of 220 millimeters, and moreover was continually in danger of coronary thrombosis.

At this moment all eyes were fixed on chief surgeon Dr Pan Zhi [3382 3112] as he with practiced, dexterous movements freed the aorta from the chest structure. He took from the nurse a soft, white and extremely elastic goose-feather artificial artery and attached it in the patient's chest. All eyes were rooted to this artificial artery.

Working with the close cooperation of his assistants, Dr Pan Zhi needed only 26 minutes to complete the operation of excising the diseased aorta and implanting the goose-feather artificial artery, and of that time only 13 minutes was needed for anastomosis. The entire operation required 3 1/2 hours. After the operation the arteries at the back of the patient's feet had a good pulse. All those who observed Dr Pan Zhi's excellent skills were deeply impressed and all felt that the sickroom use of goose-feather artificial arteries is good news for patients suffering from diseased arteries.

[illegible]-feather artificial arteries appeared internationally as an artery substitute during the 1950's. As early as 1974 in the Shanghai Chest Hospital, under the leadership of Dr Pan Zhi, the researcher Rao Tianjian [7437 1131 0756], with the cooperation of the technician Qian Ziaoping [6929 1420 5493] and the worker Lin Zhenhua [2651 2182 5478] of the Suzhou Silk Fabric Test Plant, carried out repeated tests and improvements to create a machine woven polyester fiber artificial artery. This was used in 18 tests on animals, the longest test going on for 365 postoperative days. These tests proved that artificial arteries constructed of feathers were far better than woven or sewn ones. This is yet another major scientific accomplishment since the first Chinese use of nylon and polyester artificial arteries. This accomplishment not only fills a void and attains international levels of advancement, but in some aspects also leads to new developments. For example, in using a sewn construction to replace the foreign woven construction, there is less water seepage, blood seepage is reduced, and there is a lesser rate of complications caused by blood seepage and swelling. In 1964 they obtained new evidence and made advances regarding the diameter of artificial arteries, eliminating such things as coagulation in artificial arteries. What people found especially pleasing was the cooperation between the hospital's pathology section and the embryology teaching and research group organized by the Fudan University Biology Department in using an electron microscope to observe the micro-structure of the inner cell wall of the artificial artery. There were new discoveries concerning the contents and significance of the [illegible] cells, something lacking on the international level.

The [illegible] visited the patient Shi Wei and he told us that he has been [illegible] comfortable, not in any way uncomfortable, the stiches removed and the incision healing fine, and that he is quickly recovering his [illegible] was wreathed in smiles as his student life beckoned [illegible]

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LIFE SCIENCES

BEIJING CHILDRENS HOSPITAL SUCCESSFULLY TREATS LEUKEMIA

Shanghai JIEFANG RIBAO in Chinese 26 Sep 79 p 1

[Unsigned article: "Beijing Hospital Achieves Success in Treating Leukemia: The Remission Rate of Childrens Lymph-type Leukemia is Already Over 95 Percent"]

[Text] The Beijing Childrens Hospital has obtained pleasing results in curing leukemia. The remission rate for childrens lymph-type leukemia has already exceeded 95 percent.

Leukemia is a tumorous disease which the masses commonly call "blood cancer." The cause of leukemia is the production of immature white cells in the bone marrow. These white cells fill the bone marrow and prevent the formation of the body's requisite white corpuscles, red corpuscles and blood platelets, thus endangering the patient's life. There are several barriers to be overcome in the cure of leukemia. The first is that at one stage in the course of the cure a great many white leukemia cells must be destroyed in the body to permit the normal recovery of the bone marrow and the blood. This is called remission. The second is that while the patient is in remission the treatment must be maintained for about three years to prevent the recurrence of the leukemia. In the past the Childrens Hospital did not place emphasis on researching and curing this disease so the results were less than ideal as the great majority of the patients gradually succumbed to the disease.

In the latter part of 1977 Childrens Hospital took up the cure and scientific research of leukemia as its main focus. The medical personnel made diligent studies of the relevant materials and discussed the most advanced Chinese and foreign treatments of this disease and combined this with their past experiences and learning to devise a logical method of treatment. With the aid of the Beijing Municipal Tumor Prevention Institute the medical personnel boldly used radiation treatment, which was recorded in foreign medical journals but seldom used in China, and were successful in reducing the recurrence of leukemia. This hospital has now attained a 95 percent remission rate of childrens lymph-type leukemia and there also is an obvious improvement in the remission rate of non-lymph-type leukemia. Some patients have already undergone over 2 years of treatment without recurrence and possibly are completely cured.

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TITLE: "Haemocyanins: Electron Microscopy and Their Conjugation With Other Molecules"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 1-12

TEXT OF ENGLISH ABSTRACT: The mocular profiles of haemocyanins of the Chinese horseshoe crab, Tachypleus tridentatus Fig. 1a and 1b Plate I), are either 250 Å squares, with four subunits or rings with 5 or 6 subunits. In agarose electrophoresis the molecules are present as one spot at pH 7.0 (Plate II, Fig. 5) and dissociate into four at pH 8.6 (Plate II, Fig 6).

The haemocyanin molecules of whelk, *Pogilina ternatana* (Plate I, Fig. 2a and 2b), seem to be cylindrical ones at pH 7.0 or 8.6 (Plate II, Fig. 5 and 6). The cylinders, with an overall dimension of 350 x 390 Å, are made up of 6 stacked rings of subunits. Inside each ring there is a concentric ring made up of 10 subunits.

[Continuation of SHIYAN SHENGWU XUEBAO No 1, Mar 79 pp 1-12]

The haemocyanin molecules of marine clam, *Meretrix meretrix*, are oval with about 30 subunits (Plate I, Fig. 3 and 4). There are small differences between the haemocyanins of Meretrix meretrix collected from Kwangsi and Kiangsu with respect to size and asymmetry (Fig. 3).

The haemocyanin of *Pugilina ternatana* combines with concanavalin A to a greater extent than that of Tachypleus tridentatus. The haemocyanin of *T. tridentetus* can be conjugated to prostaglandin E_2 with isobutyl chlorocarbonate without losing biological activity as demonstrated by the contraction of rat uterus (Fig. 1 [illegible]). The haemocyanin of *M. meretrix* may be conjugated to rabbit [illegible] as detected by immunoelectrophoresis (Plate II. Fig. 9 and 10).

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TITLE: "The Immune Status of Tumor-Bearing Host III. Observations on the Dynamics of the Cytostatic Effect of Spleen Cell of Tumor-Bearing Mice on Tumor Cells in Vitro (^{125}IUdR Uptake Inhibition)"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 13-30

EXCERPTS OF ENGLISH ABSTRACT: Results of our experiments indicated that spleen cells of tumor-bearing mice inhibited strongly DNA synthesis of tumor cells in vitro. Such cytostatic effect was already quite manifested at the 7th day after tumor inoculation and increased henceforth in parallel with the growth of tumor and an enlargement of spleen. After the surgical removal of tumor, cytostatic effect decreased rapidly and could no longer be detected on the 21st day after amputation and consequently the spleen returned almost to its normal size. Moreover, we have also inoculated ascitic tumor cells into thymectomized, X-irradiated, bone-marrow-reconstituted mice, and their spleen cells were also shown to be strongly cytostatic to tumor cells.

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On the other hand, our data pointed out that the spleen cells of mice bearing large Ehrlich tumor could not kill in vitro ^{125}IUdR labelled Ehrlich tumor cells as determined by ^{125}IUdR release assay. Furthermore, these spleen cells were also found to be suppressed with respect to their response to lymphocyte mitogens Con A and PWM.

Taken together, we tentatively suggest that the effector cells of cytostatic effect in tumor-bearing mouse spleen are not T, B lymphocytes. The exact nature of these suppressor cells as well as their possible mechanisms of action are now under investigation.

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TITLE: "Sister Chromatid Exchanges and Chromosome Aberrations in Cultured Lymphocytes From Normal Individuals and Persons Chronically Exposed to Ionizing Radiations"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 31-40

TEXT OF ENGLISH ABSTRACT: Comparative studies on "spontaneous" sister chromatide exchanges and chromosome aberrations in short-term cultured lymphocytes were carried out in 10 normal individuals and 10 medical workers chronically exposed to ionizing radiations. The number of SCEs for the two groups was 5.75 ± 0.42 (S.E.) and 5.64 ± 0.30 (S.E.) per metaphase plate respectively, while the number of chromosome breaks for the two groups was 2.9 and 12.6 per 100 metaphase plates respectively.

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TITLE: "Mutagenicity Testing of Thirty Six Chemicals Including Insecticides, Food Additives and Drugs with the *Salmonella*/Microsome System"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 41-50

TEXT OF ENGLISH ABSTRACT: Thirty six chemicals including insecticides, food additives and drugs were tested for mutagenicity with the *Salmonella*-microsome system. The tester strains were histidine requiring mutants TA 1535, TA 1537, TA 1538, TA 98 and TA 100. The microsomes were isolated from rat livers. Both spot test and plate test were conducted. Thirteen of them gave positive results. Dose response curves were obtained for several highly mutagenic compounds.

All compounds known to be mutagenic in bacteria and carcinogenic in mammals gave positive results in our tests. This clearly shows that Salmonella assay proves to be a valuable method, which could at least be used as a preliminary screening and early warning system for chemical compounds with potential carcinogenicity.

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TITLE: "The Effect of Ethyl Norgestrienone on Human Decidual Cells of Early Pregnancy in Vitro"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 51-58

TEXT OF ENGLISH ABSTRACT: The effect of Ethyl Norgestrienone (R_{2323}) on human decidual cells of early pregnancy in tissue culture was investigated. It was demonstrated that the administration of 200 µg which was equivalent to 2-3 times of the clinical dosage was sufficient to produce evident effect on decidual cells.

The degree and extent of injury to the decidual cells was related to the dosage and duration of treatment. And the effect on decidual cells of different stages of development varied. The larger decidual cells were more susceptible to the injurious effect, and degenerated and became necrotic first, whereas the smaller ones seemed to be more tolerant and remained alive while all larger cells were affected.

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TITLE: "The Effect of Ethyl Norgestrienone on Decidual Cells of Rats"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 59-68

TEXT OF ENGLISH ABSTRACT: The aim of the present work is to find out the effect of ethyl norgestrienone on decidual cells of early pregnancy. Rats are used as the experimental material. The synthetic steroid was administered by subcutaneous injection on the seventh day of pregnancy (the day of observation of sperms in the vaginal smear is considered as the first day of pregnancy) when decidual cells have begun to be formed. It was observed that ethyl norgestrienone exerted injurious effect on decidual cells already formed at the time of drug administration and those formed hereafter. In connection with results of other works the following points were discussed: (1) The interruption of implanation by the drug was realized through its injurious effect on decidual cells. (2) In intact animals the injurious effect of the drug on the decidual cells was essentially an indirect action of insufficiency of progesterone supply.

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TITLE: "Studies on the Antifertility Effect of Gossypol III. The Determination of the Quantities of Gossypol in Blood and Related Internal Organs After Administration of the Drug in Rats"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 69-78

TEXT OF ENGLISH ABSTRACT: In rats, the quantities of gossypol stored up in blood and related internal organs were unequal after administration of the drug. In liver, the concentration was the highest and the accumulation was the fastest in comparison with those in serum, testis and epididymis. At low dosage, the

[Continuation of SHIYAN SHENGWU XUEBAO No 1, Mar 79 pp 69-78]

accumulation was limited, and even when the animal was administrated with gossypol for a long time, the drug did not accumulate unlimitedly in the body. The retention of gossypol was not serious, and its level became dropped soon after the cessation of drug administration. At the same time, the treated animals gradually regained their fertility. The concentrations of gossypol in blood and liver increased with the increase of dosage administrated. Through liver-bile duct system, large quantities of gossypol excreted with feces. Furthermore, it was observed that, within a certain range of doses, the more gossypol was given, the more was the amount excreted.

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TITLE: "Studies in Vitro on the Inductive Action of the Node Region of Different Ages of Chick Embryo"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 79-98

EXCERPTS OF ENGLISH ABSTRACT: It has been demonstrated that when node grafts (inductors) taken from chick embryos were transplanted in ovo to the host blastoderms of stage 4, the region of the induced structures obtained could not always be accounted for the inductive specifity of the graft. It is because of the interference of regional host influence (Tsung, Ning and Shieh 1965). As an extension of previous investigation, the specific inductive action of the node region of different ages was studied in detail by the so-called "Sandwich" technique to avoid the influence of host under in vitro conditions.

A technique of isolation of epithelium from early chick blastoderm for "sandwich" experiment and methods of cultivation are described and discussed.

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TITLE: "Synthesis of New Species and Cytogenetic Studies in Oleiferous Brassica III. Artificial Substitution of Genome C in *Brassica Napus* L. Var. *Oleifera* DC"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 99-114

TEXT OF ENGLISH ABSTRACT: 1. This paper gives an account of an artificially substituted *napus* in genome C. (*aacc'*) which was obtained by across between *B. alboglabra* (♀ *c'c'*. $2x = 18$) and octoploid *napus* (♂ *aaaa cccc*, $8x = 76$).

2. The petal colour of the F_1 plant was found to be light yellow, intermediate between those of the two parents. The F_2 families segregated to a series of color variations, ranging from dark yellow to white.

3. Morphologically, the F_1 bore close resemblance to *B. napus* variety Victory. When back crossed to the latter, it was found as fertile as the natural *napus*.

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4. A model is suggested to explain the origin of the substituted F_1 hybrid.

5. It is also noted that among the F_3 progenies some showed a high degree of resistance to certain diseases.

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TITLE: "Preparation of Karyoplasts and Cytoplasts from Mammalian Cells by Means of Cytochalasin B and Centrifugation"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAF EXPERIMENTALIS SINICA] in Chinese No 1, Mar 79 pp 115-121

TEXT OF ENGLISH ABSTRACT: Karyoplasts and cytoplasts from a human liver carcinoma cell line BEL-7404, which has been established in our laboratory since 1974, as well as HeLa and mouse A9/25 DKS cell lines have been successfully prepared by cytochalasin B treatment followed by centrifugation. Preliminary results are summarized in Table 1. Characteristics of both the karyoplasts and cytoplasts were described.

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Table 1. Current conditions for enucleating 3 cell lines and purity of cytoplasts

Cell line	Enucleating conditions				Purity of cytoplasts (%)
	Serum conc. in medium (%)	Concentration of CB (μg/ml)	Speed of centrifugation (rpm)	Time of centrifugation (min)	
BEL-7404	30	10	14.000	40	93.2
HeLa	10	5	14.000	40	97.4
A9/25 DKS	10	10	14.000	40	98.8

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